

PUBLIC WORKS

Dec.
1956

CITY, COUNTY AND STATE

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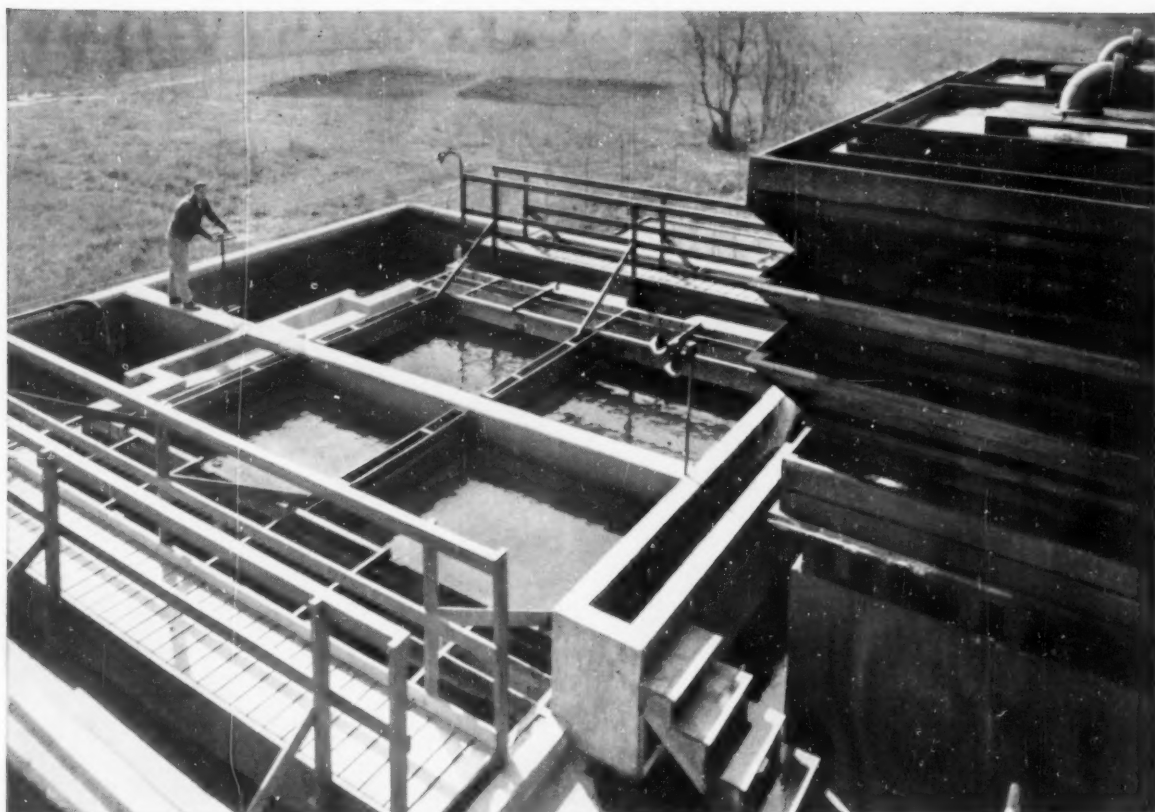


**Lloyd K. Clark, left, Consulting Engineer,
and John L. Geren, Manager of the Salem,
Oregon, Water Dept., discuss details of
new pipe line for Salem. More on page**

1206

1056

UNIVERSITY MICROFILMS
SERIALS ACQUISITION
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Raw well water with 30 parts per million of iron enters the double coke-tray *Permutit Aerator* (right) which oxidizes the iron and reduces CO_2 . Next step is the *Permutit Precipitator* (left) where lime is added to raise pH and precipitate the iron . . . clay to thicken the precipitates. The resulting floc

forms a suspended sludge blanket that speeds the chemical reaction . . . makes it more complete. Final treatment is by 5 *Permutit Pressure Filters* which remove remaining traces of precipitated iron and turbidity to deliver clear, iron-free effluent.

How *Fairless Hills* reduces iron from 30 to 0.14 ppm!

Fairless Hills, Pa., was built from the ground up to a community of 6,500 in less than 4 years . . . yet, because of good planning, there has never been a water supply problem. Before construction began, the search for water was underway.

The first test wells were disappointing . . . couldn't deliver enough. The nearest river water supply was too dirty and within the tidal basin. And when an adequate well water supply was discovered, it was acid and contained not just the usual few tenths ppm of iron but well over 30 ppm . . . 100 times the allowable standard!

Since even a few ppm of iron are considered difficult to handle, 30 parts presents a real problem. Because of the efficiency of its unique sludge-blanket design, a *Permutit Precipitator* was provided under specifications prepared by Consulting Engineer Howard A. LeVan, Jr. of Harrisburg, Pa. The unit was guaranteed to reduce iron to not more than 0.3 ppm.

"Now, the iron content is 0.14 ppm and the pH is 9.0. This equipment is doing a good job," reports H. D. Markle, Chief Engineer for the builders.

"In 29 years around the country, I've seen numerous Permutit installations doing a good job," adds Township Sup't. of Sewage and Water Supply, W. W. Willis.

It's easy to see why you should bring your water problem to Permutit. Address: The Permutit Company, Dept. PW-12, 330 West 42nd St., New York 36, N. Y.

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Occupation

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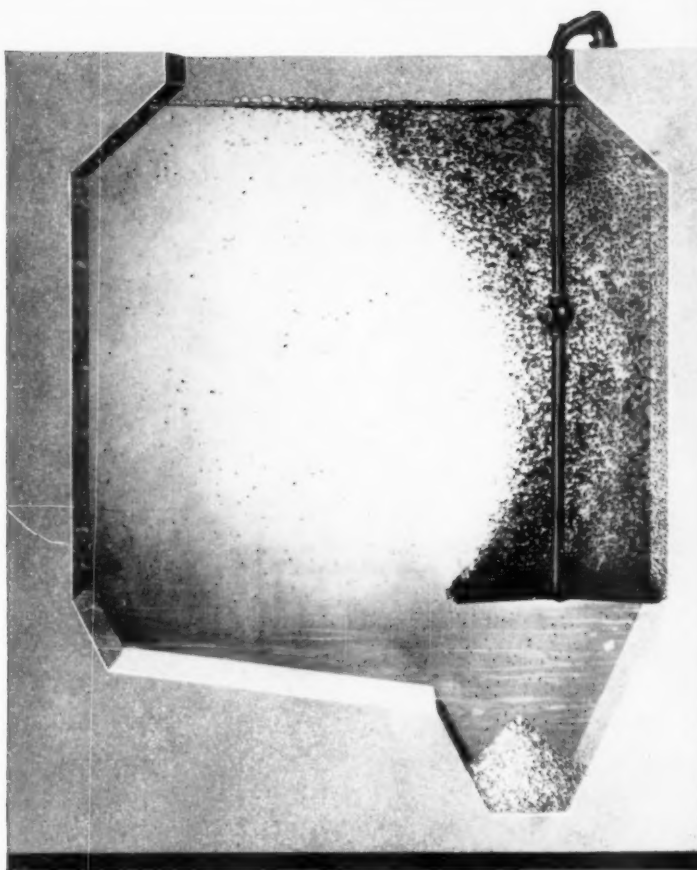
RIDGEWOOD, N. J.



"Chicago"
from

AER-DEGRITTER*

Air Controlled Settling Velocities Independent of Flow



The principle of air controlled velocities was first demonstrated in sewage treatment plants designed by the office of Charles H. Hurd, Consulting Engineer. The Hurd method, using diffuser plates located behind the hopper, was an improvement over the then practiced means of controlling grit tank velocities. The Aer-Degritter* using diffuser tubes located directly above the hopper is, in turn, an improvement on the Hurd method.

The Aer-Degritter* removes grit and sand from sewage through the use of air to effect a controlled velocity of the sewage in the grit tank. The method provides a quiescent zone beneath the air diffusion media to effect a selective deposition of clean grit without organics. There is no need for separate grit washing tanks. Washing and deposition are effected in a single tank.

POINTS OF SUPERIORITY OF THE AER-DEGRITTER*

1. *Relative location of grit hopper and air diffusers.* In the Aer-Degritter* the diffusers are elevated above the tank floor and the grit hopper is directly beneath the air diffusers. This permits greater flexibility of control of tank bottom velocities regardless of volume of sewage flow. It is these bottom velocities that control the deposition of clean grit and fine sand without also depositing organic material. Tests made on grit removed by Aer-Degritters* have consistently shown less than 0.05% putrescibles.

2. *The equipment used to introduce air to the sewage.* The use of Swing Diffusers and Precision Diffuser Tubes permits easy access to the grit hopper and cleaning of the diffuser media without taking the tank out of service.

*The application of the equipment, as well as the equipment itself is covered by U.S. Patents No. 2,532,457, No. 2,144,385, No. 2,328,655 and No. 2,555,201.

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**"Nothing can come
up to this D4—
except another
Cat-built machine"**



THAT's the opinion of Junior Greene, operator of the CAT* D4 Tractor owned by the City of Belle Glade, Fla. In this picture the machine is bulldozing overburden and building ramps. For nine years it's been the city's utility tractor, ready to work wherever and whenever it's needed.

You can get the same kind of ruggedness and long work life in today's new D4 Tractor. From its specially hardened track shoes and pins to its husky 63 HP (fly-wheel) Caterpillar Diesel Engine, the new D4 is built to outwork and outlast any other tractor in its class. It's available with the exclusive Caterpillar oil clutch, which prolongs facing life and greatly lengthens the period between clutch adjustments. The Cat-built 'dozer is available with straight or angle blade to suit your operation and is of heavy-duty construction to stand up to 'dozer-busting rock work.

The D4's Caterpillar Diesel can deliver full power or idle, without fouling, on money-saving, non-premium fuel, thanks to its exclusive, large-orifice fuel injection

system. And because of four-cycle design, there are no air boxes or cylinder ports to clean. Highly effective filters and seals keep lubricants in and harmful abrasive particles out of engine and moving parts.

The D4 is compact and maneuverable, yet able to do a man's-size job without pampering or down time. Your Caterpillar Dealer will gladly arrange an on-the-job demonstration. He has facts and figures to prove to you that the Cat D4 Tractor is built to do *more* work at *less* cost for *your* community than any other crawler its size. See him today. And count on him for prompt, skilled service and parts you can trust.

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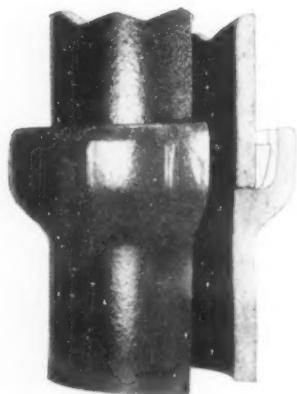
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**THE MOST USEFUL ENGINEERING MAGAZINE
FOR CITIES, COUNTIES AND STATES**

field tests prove **AMVIT* JOINTED CLAY PIPE** will outperform, outlast, substitute materials



During and following World War II, there were serious shortages of vitrified clay pipe. Production was being channeled into defense and military construction.

In order to meet pressing needs, many cities revised their codes to permit the use of *substitute* materials, instead of time-proven clay pipe.

Today, after facing the severe test of time and service, many of these *substitute* non-clay lines are breaking down. There have been hundreds of pipe failures, which endanger the health and welfare of the community and result in costly repairs.

Field tests on over 100 Amvit installations completed in the last two years show that Amvit jointed clay pipe positively cannot be harmed by sewage. It's strong and rigid, can't sag, rust or pit. Roots cannot pierce the dense, rock-like pipe walls or its tight compression joint.

Specify Amvit Jointed Clay Pipe, in sizes 4" through 24", together with all standard fittings. It is available for immediate delivery in the Northeast and Central States.

For more information, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.



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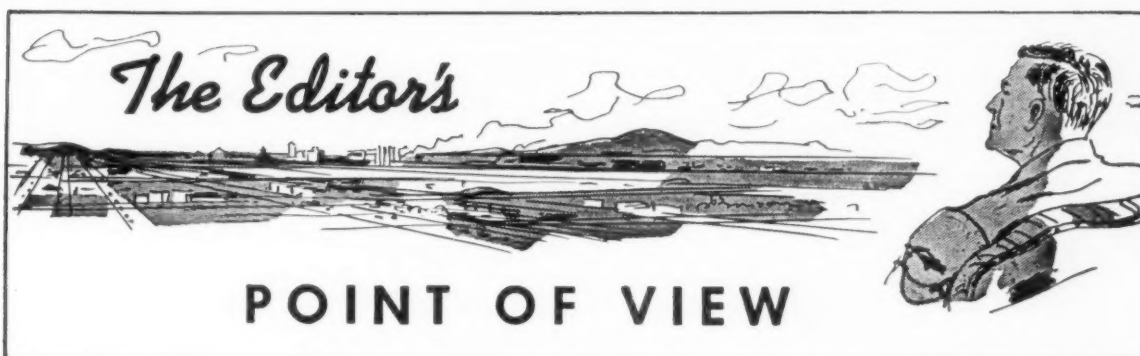


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Products Company**

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MANUFACTURERS of: Clay pipe, flue
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No Gold Likely from Garbage, but Disposal Costs May be Reduced

AS THE PROCESSES of composting are being subjected to scientific study, it is becoming increasingly evident that this is a field with definite promise in ultimately reducing the cost of municipal refuse disposal. It is also quite evident that composting is not universally usable. Some cities are too small for an economical installation; others lack suitable areas where processing can be carried on without violent citizen complaint, since four or five months are likely to be required to produce the finished product. The prospect of storing a third of a year's production of decomposable refuse is not an attractive idea to most municipalities, bearing in mind the hazards of fly production and odors.

Though the long range outlook is good in that, under favorable conditions, composting may reduce disposal costs, we hope no city will sit and do nothing while waiting for the rainbow's end. Why not try sanitary fill or incineration meantime?

Maybe the British Have a Better Name for it.

IN THIS COUNTRY we use the terms "sewage treatment plant" and designate the man in charge as "Sewage Plant Operator" or "Superintendent of Sewage Treatment." This does, at times, pose a problem in public relations for it is not always easy to sell the public on the beauties and advantages of this necessary but non-glamorous facility. In addition, the loose and widespread use of "operator" needs reconsideration, since it implies a position of minor responsibility. The English have pretty much gotten away from this concept of calling a spade a spade and generally employ the term "purification works" with the man in charge being the "Manager."

We have long felt that a public relations program is seriously needed in the waste disposal field, one perhaps generally similar to the campaign so successfully initiated a few years ago by the American Water Works Association. One of the early problems, in case such a program should be developed, would be a determination of the

nomenclature to be used, and whether or not it would be wise to attempt to overcome the repugnance often encountered when we begin to talk about sewage and sewage treatment.

The Question of Street Openings

WITH TWICE AS many cars on the street as there were a few years ago—but practically no more streets—our cities can no longer afford to allow street cuts to be kept open beyond the minimum necessary period, nor to delay in prompt repair of the opening. This means a reliable method of compacting backfill to permit quick replacement of the permanent pavement; and an organization that is sufficiently flexible to get around quickly to doing that job.

Many methods of compacting backfill are in use; none has been widely adopted. What works well with sand may not work in clay. A broad study to develop workable procedures in all types of soil is needed; and in order that all technical people will be properly reached, most of the engineering associations ought to join in.

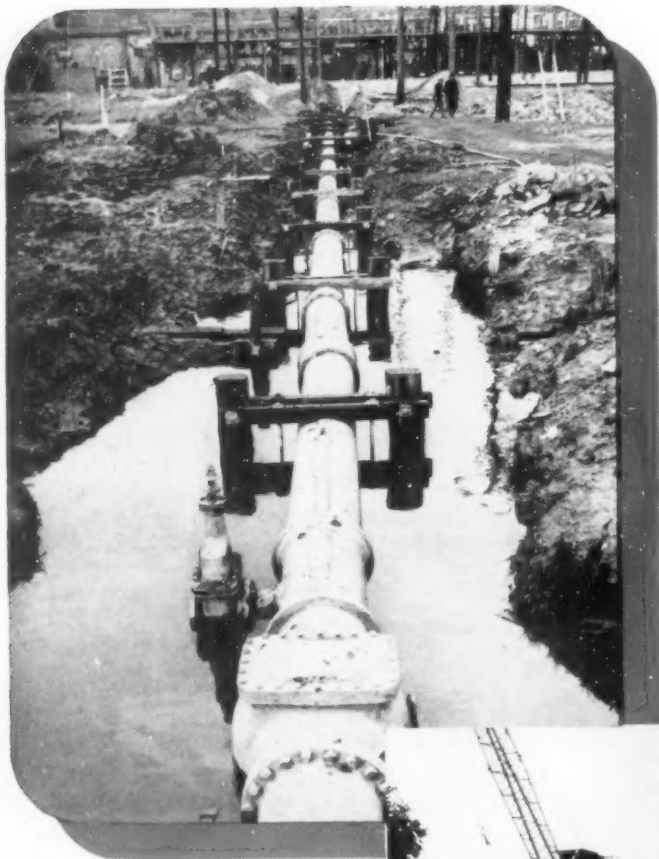
It is Good for an Engineer to do Some Writing

AN ENGINEER'S future, to a large extent, may hinge on his ability to express himself clearly, concisely and, more often than he may realize, interestingly. This is true whether he is called upon to prepare a report, to speak publicly, or to write an accurate, readable description of a project he has been engaged on. Being able to write well will help in public speaking, because both depend on an orderly presentation of thoughts, previously outlined in some detail. In fact, a fully prepared text furnishes an excellent background for a talk, especially when the text was prepared by the person making the speech.

Not that we need to solicit articles, though we can always find room for more very good ones; but we feel strongly that engineers should write more—and better. We will not try to tell our readers how to improve their writing; but we are willing for them to try their budding skills on us. Pick a good subject and tell about it logically, clearly, and interestingly.

A Merry Christmas and a Happy New Year to All our Readers

You can bank on it for jobs



20" Mechanical Joint Water Feeder Main installed at Atlantic City, N. J.

About 14 miles of 16" Mechanical Joint pipe installed for supply line for water district in South Carolina.



When your reputation is at stake...when the public deserves and should get dependable service...play safe by installing cast iron pipe. Through our consistent program of national advertising, the public knows that cast iron pipe serves for centuries—is reliable and economical. Today, *modernized* cast iron pipe, centrifugally cast, is even tougher, stronger and more uniform in quality than the pipe our industry made a century ago. For further information, write Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3.

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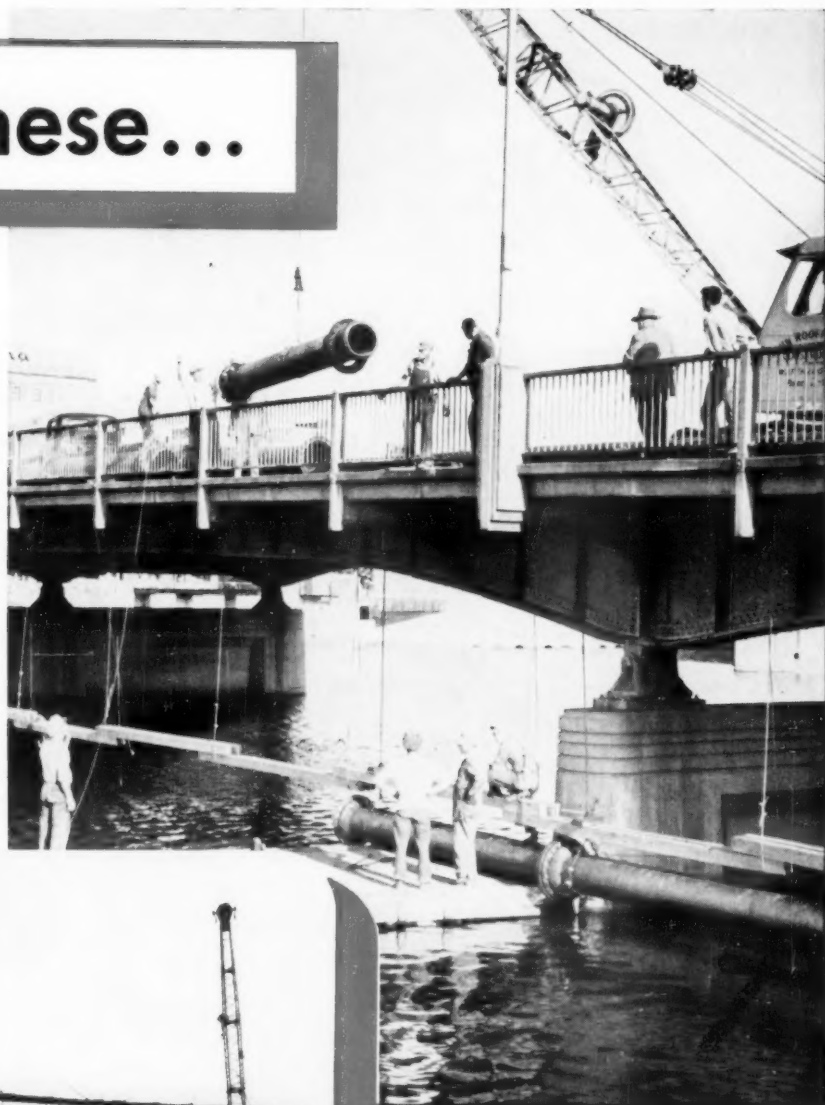
The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.



Nearly two miles of 6" to 20" cast iron pipe for potable, process, and fire protection water systems and sewer system for petrochemical plant in Tuscola, Illinois.

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Installing 24-inch Flexible Joint cast iron pipe for river crossing at Fort Lauderdale, Florida.

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Progress in Pittsburgh....



ALLEGHENY COUNTY AUTHORITY

SPECIFIES **LONG LENGTH**
CONCRETE PIPE

with

RUBBER and STEEL

AMSEAL JOINTS



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American-Marietta's up-to-the-minute facilities in Pittsburgh are supplying many miles of high-quality, long-length concrete pipe with Amseal Joints to many of the nation's leading contractors for their work on both tunnel and open-cut interceptors. Approximately 50 varying sizes and designs are being made on schedule to meet the project's anticipated completion date.

The Amseal rubber and steel joint provides positive protection from both leakage and infiltration while the hard, dense, high-strength concrete guards against devastating and erosive sewage. Long lengths (16 ft.) speed installation, reduce number of joints, and mean real savings to owners both in construction and in operation.

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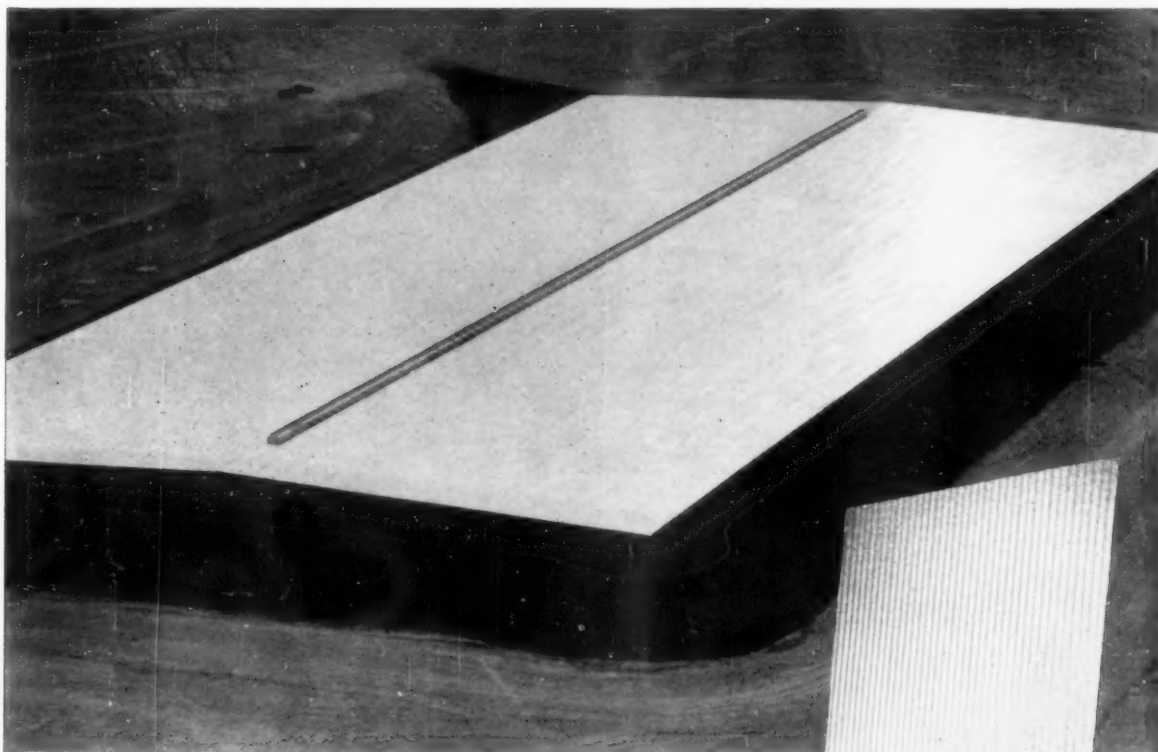


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CONCRETE PRODUCTS DIVISION

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AMERICAN-MARIETTA BUILDING

101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5600



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30,000,000 GALLONS of water in the Las Vegas Water District reservoir are now protected by a cover of Kaiser Aluminum Roofing.

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PUBLIC WORKS for December, 1956

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3-yd 4-in-1

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It's a **3-yd. Skid-Shovel...**



with Drott's exclusive "concrete-shattering" triple-power pry-over-shoe break-out action—and 42" ground level bucket roll-back. Skid-Shovel position also gives you time-gaining, strain-saving load transport on the exclusive Skid-Shoes!

It's a **3-yd. Clamshell...**



that "surrounds" loose materials and fills in one fast gulp. And the bottom-dumping clamshell gives you a 2½-foot dumping height advantage over ordinary roll-forward buckets—plus positive, clean-out action even when handling sticky materials!

"FLEET-BEATING PERFORMER"

"A new 3-yd. TD-18 4-In-1 Skid-Shovel proved able to do as much work as 3 power shovels and a drag-line digging up and loading old concrete pavement on one of my recent highway jobs," reports Henry E. Berghuis, Prinsburg, Minn. "The 4-In-1 loaded up to 1,700 lineal feet of old pavement daily. Using 4-In-1 Clamshell bottom dumping, I also loaded out 4,500 yards of wet, sticky gumbo no other loader could tackle!"





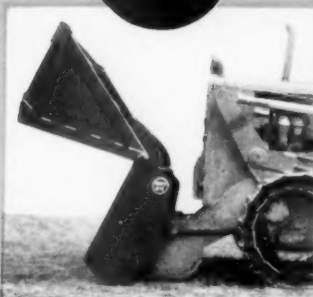
NOW..
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with clam lip up, and shoes on the ground, the blade rolls the earth with precision. You regulate dozing depth with ease and accuracy by hydraulic "radius control" of blade pitch (forward and backward).

Touch the new 3-yard TD-18 Four-In-One's machine-selector lever! See how you instantly get any material-moving action you need—from the seat, with finger-tip ease—and stopped or on-the-go. Prove you can beat a fleet of limited-duty rigs with this versatility unlimited—get big-income, tough jobs other rigs

can't handle! Compare the capacity-adding advantages of Drott exclusives like shock-swallowing Hydro-Spring and heap-keeping, parallelogram raise action. See your nearby International Drott distributor for a TD-18 Four-In-One demonstration. Or try the 1-yd. TD-6, 1½-yd. TD-9, or 2¼-yd. TD-14 Four-In-One!

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that's *Streamlining*
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...and lowering the cost!

The

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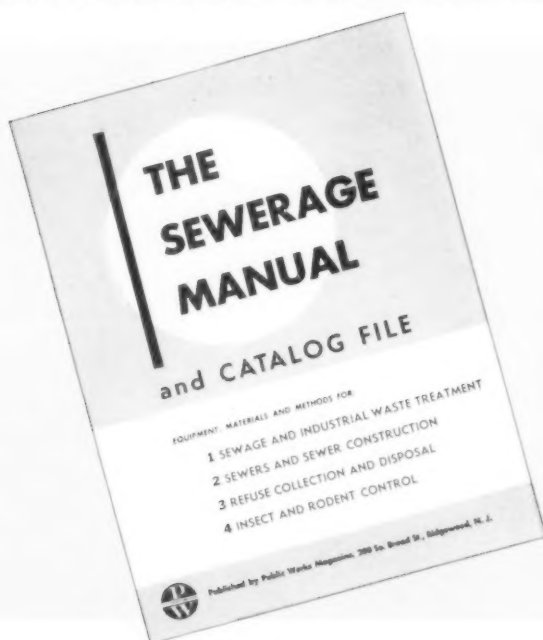


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NEW 1956 EDITION SEWERAGE MANUAL and Catalog File



Bigger and better than ever. Completely revised to September 1956. Liberally illustrated. More advertisements of representative manufacturers than any other publication in its field. The easiest and most authoritative way to learn of the latest in equipment and materials—all in one handy book for quick and easy reference.

Mailings just completed to 11,000 consulting, city, sanitary, industrial wastes and armed forces engineers, and superintendents of sewage treatment and refuse disposal.

**WATCH FOR YOUR COPY. USE IT
THROUGHOUT THE YEAR
AND PROFIT**

Helps you in these 9 invaluable ways

- To get manufacturers' names and addresses
- To obtain full catalogs of manufacturers
- As a means of reviewing treatment methods applicable
- To locate a product the name of which has been forgotten ("Your memory's best friend")
- To avoid overlooking a product that might be used
- As a quick review of what is available, before preliminary plans are prepared
- To obtain prices
- To refer to in office conferences leading up to selection of equipment or materials
- To explain equipment needed to laymen, members of councils or commissions

Contents

- 1—Screenings and Grit Removal
- 2—Sedimentation
- 3—Trickling Filters and Related Methods
- 4—Activated Sludge Treatment
- 5—Sludge Digestion and Gas Utilization
- 6—Disposal of Sludge
- 7—Disinfection and Odor Control
- 8—Pumps for Sewage and Sludge
- 9—Treatment of Industrial Wastes
- 10—Sewers and Sewer Materials
- 11—Equipment for Operation Control
- 12—Maintenance of Sewers
- 13—Construction Equipment and Materials
- 14—Equipment and Materials for Municipal Sanitation

**PUBLIC
WORKS**

Publications

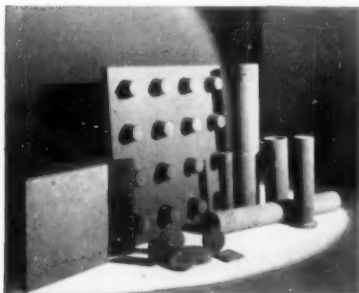
200 SOUTH BROAD STREET

RIDGEWOOD, N. J.

ADVERTISING OFFICES ALSO IN — CHICAGO — CLEVELAND
SAN FRANCISCO — LOS ANGELES — KANSAS CITY

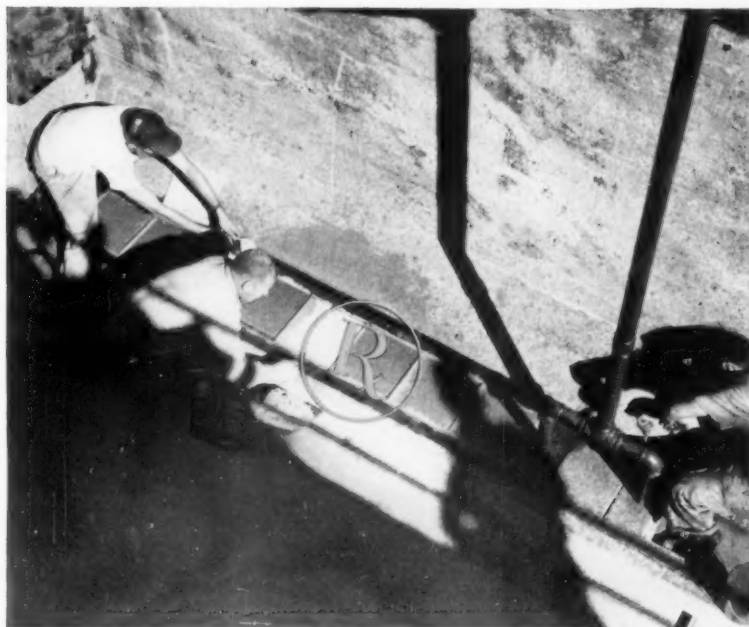
Two ways you save with Norton plates

NORTON R
(engineered and prescribed)
*porous mediums last
extra-long, reduce
maintenance in both
sewage and filtration
plants*

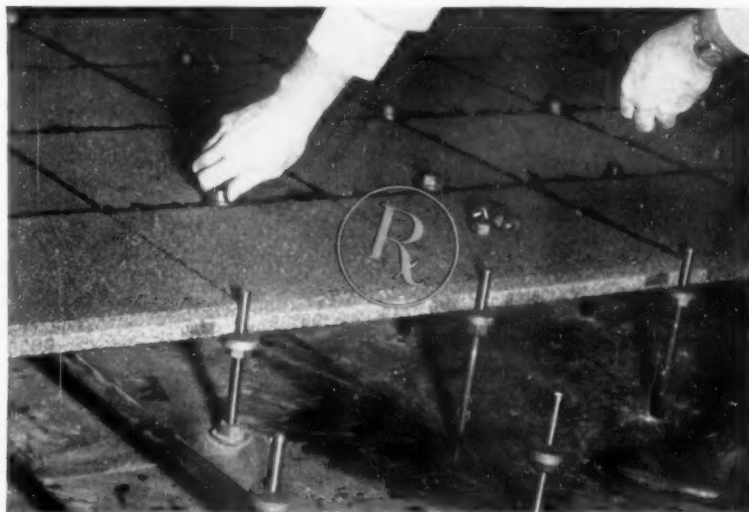


Public works engineers all over the country know that among the most dependable aids to efficient, economical sewage disposal and water filtration are Norton ALUNDUM porous mediums — *engineered and prescribed* for longest lasting, lowest cost performance.

Thanks to their *controlled structure* processing, Norton mediums have the even distribution of pores that makes them the ideal R for uniform diffusion. And Norton tubes have this uniform diffusion over their entire area, because of their seamless construction — which also makes them much



After 16 years of service, Norton ALUNDUM plates are replaced with new ones in a modern sewage disposal plant.*



Good for many years to come. A water filtration plant makes sure of long, trouble-free service by installing Norton plates.

easier to clean.

You get additional savings with Norton porous mediums because of their exceptional resistance to breakage and chipping and to cleaning acids. Made in the form of plates, discs and tubes, they cover a wide range of applications, including activated sludge aeration and gravity, pressure or diatomite filtration.

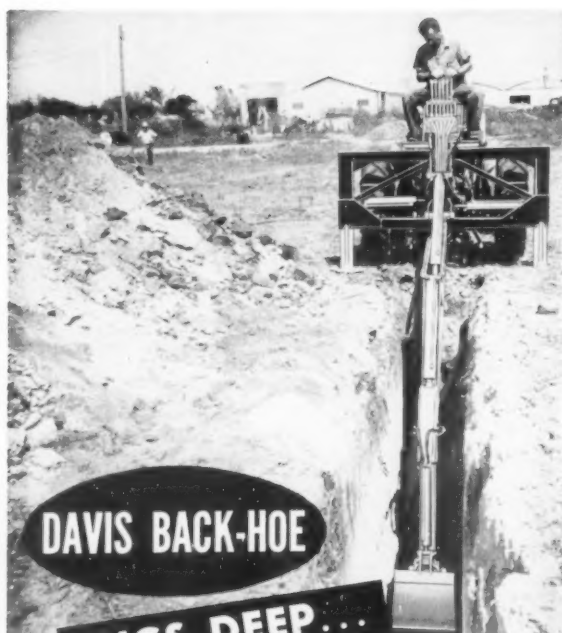
Norton can help you by supplying illustrated booklets, charts, tables and other important information on your own use of porous mediums. Ask your Norton Repre-

sentative or write direct to NORTON COMPANY, Refractories Division, 231 New Bond St., Worcester 6, Mass.

NORTON
POROUS MEDIUMS
Engineered... R... Prescribed

*Making better products...
to make your products better*

*Trade Mark Reg. U. S. Pat. Off. and Foreign Countries



DAVIS BACK-HOE

DIGS DEEP...

DUMPS FAR TO THE SIDE

LETS YOU SEE ALL THE WAY!

The Davis Back-hoe takes the guesswork out of digging... stops the worry of cutting through gas, sewer, or water lines. You can dig 13' deep, and still see exactly where the bucket bites in. And you can dump all the excess to just one side, leaving plenty of working space between the pile and the hole to eliminate back-dropping. That's because the Davis will dump...as well as dig...at right angles to the tractor. It is designed for greater utility...comfort and visibility. Compare in quality, versatility, and price with any on the market. IT OUTPERFORMS THEM ALL!

... AND A GREAT RUNNING-MATE THE DAVIS LOADER



You can't buy a better loader than Davis. You get maximum strength, maneuverability, visibility, and versatility, because of the streamlined, functional design and many different attachments. You can attach or detach the Davis Back-hoe from the Loader in less than 5 minutes. Ask about the Davis Combination Deal!

SOLD AND SERVICED NATIONWIDE BY BETTER DEALERS

Mid-Western Industries, Inc.

1009 South West Street
Dept. P, Wichita, Kansas

Please send me literature and name of dealer on
Davis Loader ☐ Davis Back-hoe ☐

to fit a _____ tractor.
(Please Print)

NAME _____

ADDRESS _____

TOWN _____ STATE _____



LEADERS

IN

PUBLIC WORKS

Lloyd K. Clark, shown at the left on our front cover, and John L. Geren, have teamed together on the multi-million dollar job of bringing more much-needed water to Salem, Ore. Mr. Clark is one of the partners in Clark, Groff & Cave, Consulting Engineers of Salem; Mr. Geren is Manager of the Salem Water Department. Mr. Geren is a civil engineering graduate of Oregon State and holds a master's degree from the University of Michigan. Mr. Clark is a civil engineering graduate of North Dakota State College and has a degree also from MIT, plus graduate study at Cornell. Both men served meritoriously during World War II, and both held the rank of Lt. Col. at its close. Mr. Geren was in the Field Artillery in the Aleutians and Europe and, after the war, served with the Public Health Section of Military Government in Europe. He has maintained his activity in the Reserve since returning to Salem. Lloyd Clark served in 7th Service Command HQ, in the Office of the Surgeon General in Washington and in the Southwest Pacific and Philippines, mostly with the Sanitary Corps, but also with the Engineers.

John Geren started his engineering career with the Bureau of Public Roads; then he became a County Sanitary Engineer. In 1946 he became Assistant Manager of the Salem Water Department, being promoted to Manager in 1952. Lloyd Clark went through the grades to become State Sanitary Engineer of North Dakota in 1939; after the war he worked with the Association of American Railroads. In 1950, he established a consulting office in Salem with his brother and Gil Groff; Mr. Cave joined the firm later. The Salem water project, part of which is shown on the plans in front of the two men, involves a 48 and 54-inch pipe line some 20 miles long to the upper reaches of the North Santiam River.

John Geren has one son, Ivan, who is just out of a 2-year stretch with the Marines. His wife, Geraldine, shares his interest in golf to the extent that she won the local women's championship recently. Though golf is one of his hobbies, he has a more than passing interest in good music via high fidelity. Lloyd Clark, in his spare time, is Consultant to the Surgeon General of the Army in sanitary engineering matters. He and his wife, Edith, have three children, Kim, Mary and Ann, 14, 12 and 10, respectively. Hobbies? Mostly hay-burners, otherwise horses, some of which they keep on their farm outside Salem; and camping (including fishing) along mountain streams or on the coast.



Now...smooth, wide and handsome ...in durable Asphalt concrete

Concord, New Hampshire's Main Street isn't a rough-riding street anymore. It's smooth-riding, quiet and comfortable. Safe and skid-resistant . . . Asphalt concrete.

It's wider than it used to be, too. With ample space to move. To pass. To park. And modern Asphalt construction helped speed the job.

What's more . . . the entire widening and resurfacing job was done at a satisfying low cost. And traffic was maintained all through construction.

Generations to come will appreciate

this new Asphalt pavement. For its smooth riding. Its durability. Its easy, economical maintenance.

From every point of view . . . including the taxpayer's . . . choose Asphalt construction on **your** new designs. Then you'll be sure to be safe.

Write for a helpful new manual on Asphalt construction. **Thickness Design of Flexible Pavements for Streets and Highways** has been brought right up to the minute. It's yours for the asking. Write: Dept. X.



Mr. Woodbury Brackett, City Manager of Concord, N. H., writes:

"New Hampshire's capital city is pleased with its choice of Asphalt pavement for its busy main street.

"Traffic kept moving during construction, with a minimum of inconvenience.

"Our Asphaltic main street is easy to keep spotlessly clean, traffic lines show up clearly and pavement cuts for utility repairs are easily made and replaced."



Ribbons of velvet smoothness . . .
MODERN ASPHALT HIGHWAYS

THE ASPHALT INSTITUTE, Asphalt Institute Building, College Park, Maryland



A. W. W. A. HYDRANTS

EASY TO
OPERATE
AND MAINTAIN



Ludlow hydrants incorporate all the advantages and meet all the requirements for safety, durability and economy.

HERE'S WHY:

1. **POP-OFF SLEEVE COUPLING:** releases hydrant head from stem in event of traffic damage.
2. **BREAKABLE GROUND LINE FLANGE** eliminates digging.
3. **NO FLOODING.** Closed hydrant remains locked—even in event of traffic accident.
4. **NO FREEZING.** Positive drip action, at extreme bottom, assures complete drainage.
5. **90,000 TENSILE STRENGTH** rolled Everdur threaded stem section completely eliminates stem failure.
6. **LESS OPERATING TORQUE.** New, non-binding upper and lower "O" rings trap lubricant . . . assure positive water tight seal . . . require no servicing.

THE RESULT: LOW INITIAL COST—YEAR AFTER YEAR—OF TROUBLE-FREE SERVICE.

"NO POSSIBLE DIFFERENCE IN FIRST COST CAN OVERBALANCE THE PERPETUAL ECONOMY OF QUALITY."

15

Ask for
Bulletin 54-H



THE

LUDLOW

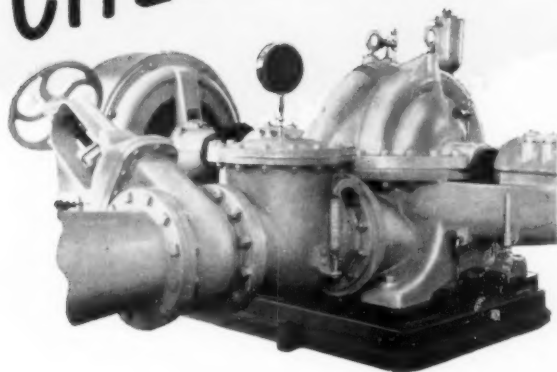


VALVE MFG. CO., INC. TROY, N. Y.

GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES
CHECK VALVES • TAPPING SLEEVES • AIR RELEASE VALVES



CLEARWAY—QUIET CLOSING CHECK VALVES



Low cost insurance against severe slam on pump shut down is provided in the Rensselaer clearway, quiet closing, non-slam check valve.

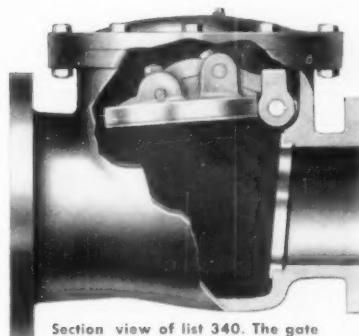
In operation, the gate is normally completely out of the line of flow and head losses are extremely low, even at high velocities. The lever arm and adjustable spring force the gate toward its seat on pump shutdown and the gate seats firmly at the instant of zero velocity, without slamming.

The List 340 Spring Check Valve may be installed in either horizontal or vertical pipe lines and is made in sizes up to 30 inch and pressures of 200 lbs. with flange ends only. Dual levers and springs may be provided for extreme conditions. All parts are readily accessible through the large removable cover.

The increasing type illustrated bolts directly to the pump discharge flange, eliminates increasers and saves valuable space. For locations where slamming is not anticipated, the Rensselaer list 37 without lever and springs is recommended. For higher pressures, the List 39 operates on non-shock cold water, oil or gas up to 400 lbs. W.P.

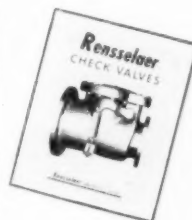


List 340 Clearway, quiet closing check valve: increasing type with flange ends.



Section view of list 340. The gate is completely out of the line of flow in open position.

Ask for
Bulletin "E"



Rensselaer

VALVE CO.

TROY, NEW YORK

DIVISION OF
THE LUDLOW VALVE
MANUFACTURING CO., INC.

GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES
CHECK VALVES • TAPPING SLEEVES • AIR RELEASE VALVES



WHAT'S YOUR BEST BUY IN CHIPPERS?



ASPLUNDH

here's why...

Asplundh Chippers have been engineered, developed and *proven* by the largest tree company in the world, to whom *safety, speed and economy* in operation are paramount considerations... yours to benefit by when you use Asplundh Chippers.

Exclusive features include positive-locking tapered blades and wedges for *absolute* safety. A minimum of moving parts that means less maintenance, lower repair costs. A 300 lb. flywheel to assure uniform *faster chipping action*, and that permits a reduced power unit resulting in lower operating costs.

Modern design, combining the most advanced engineering with pleasing appearance for your better public relations.

These are but a few reasons why Asplundh Chippers are *your best buy*; for the whole story on how Asplundh Chippers can benefit you, send coupon below for FREE CHIPPER BOOKLET.

Better still, ask for a no-obligation demonstration.



ASPLUNDH CHIPPER COMPANY
505 York Road Jenkintown, Pa.

Dept. W-4

- ☐ Send FREE BOOKLET, *The Modern Approach to the Brush Problem*
☐ Arrange free demonstration.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

BY ACTUAL TEST THE FASTEST CHIPPER MADE

LETTERS TO THE EDITOR



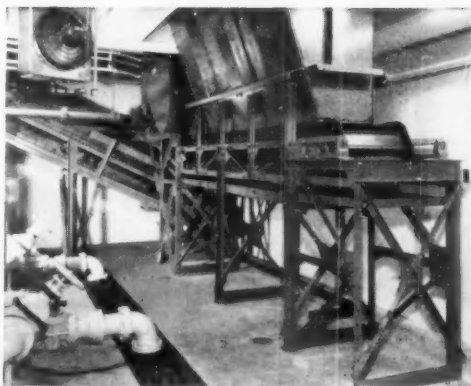
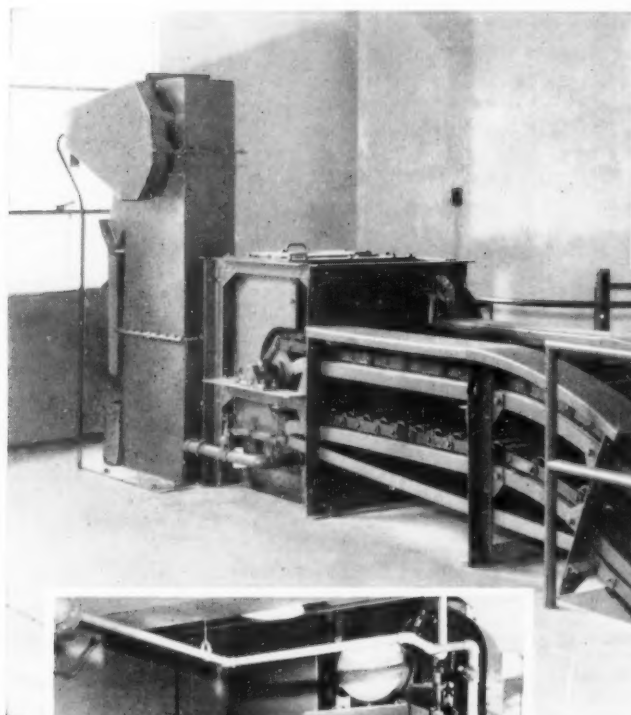
PHOENIX IS A GROWING CITY

Additional information about our plans in Phoenix may be of some interest to you. We have retained consulting engineers to prepare studies and reports on five large problems and our own City staff is making studies and preparing reports on others. It is the intention of the City Council to call for a vote of the people early next spring on a very large program to cover the City's needs for many improvements needed within the next few years. As you know, the growth of Phoenix is one of the most rapid in the country and we are trying to plan accordingly.

We will have cost estimates and reports for storm sewers, sanitary sewers, airport expansion, water production and distribution expansion, acquisition of privately owned fringe water companies, major street improvements, parks, public buildings and others. These matters will be voted on separately of course, but at all one election. A very large citizens' committee is being created with subcommittees to cover each part of the problem. These committees will study all of the information which we are collecting and make recommendations and suggestions.

As regards street lights, we are getting to be a very well lighted city. In August, 1951, we entered into a contract with the Arizona Public Service Company which we anticipated would adequately provide for the lighting of the City in a period of about four years. We have done all that was intended but the great growth of the City means that we are continuing to have to extend our lighting system. The City area has more than doubled since 1950. On August 1, 1951, we had 1,794 street lights and on September 31, 1956, we had 6,672. The funds budgeted for street lighting in the fiscal year 1950-51 were \$76,856 and the amount budgeted for 1956-57 was \$347,440. (Turn to page 26)

Trucks dump garbage into this hopper. A slow-moving apron conveyor discharges onto the faster-moving apron conveyor, thinning out the material.



This apron conveyor drops the garbage into a Jeffrey Type B grinder. The bucket elevator at the left discharges grit from the washer seen below.

From the grinder the garbage passes into the washer where grit is removed. The organic slurry overflows into the slurry tank and is pumped to the digesters.

JEFFREY

recommends dual
garbage-sewage disposal
for low operating costs



CONVEYING • PROCESSING • MINING EQUIPMENT • TRANSMISSION
MACHINERY • CONTRACT MANUFACTURING

Garbage can be economically disposed of with sewage solids. Jeffrey sanitation engineers have found that garbage solids can be ground and pumped directly to digesters. Grit is removed first, of course. That is the system illustrated here at the new treatment plant in Kokomo, Indiana.

For help on any treatment plant problem, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

How many yards per hour?



PAYLOADER® "more yardage" features

Balanced four-wheel-drive, torque-converter and exclusive power-transfer differentials give more effective traction on mud, gravel, ice and snow for more reliable crowding power. Coupled with this crowding power is the unusual pry-out action and 40° tip-back of the bucket at ground level to get full bucket loads with less spillage loss. The result is that a "PAYLOADER" can

The 40° tip-back of the bucket at ground level permits a carry position that is close and low for maximum stability and with bucket opening almost level to prevent spillage of heaped loads. Hydraulic system shock absorber cushions the loaded bucket while carrying, smooths the ride and allows higher carrying speeds with less spillage. These features enable a "PAYLOADER" to

It's the yards delivered that count on any job and that's where a "PAY-LOADER" really pays off. It gets more load in the bucket with less spillage to begin with — it can carry at higher speeds with less spillage — it can maneuver faster because the power-shift transmission requires no stopping for ANY shift. All these advantages enable "PAYLOADER" tractor-shovels to

dig more carry more deliver more

More yards on any job!



No one knows better than you that a rubber tired tractor-shovel can do so many jobs, under so many kinds of job conditions, that the yardage handled can vary considerably. That's why yardage figures can be so misleading unless all the factors are taken into consideration . . . kind of material . . . whether in-place or re-handling . . . operator efficiency . . . length of haul . . . waiting time for trucks . . . one location or scattered jobs, and many other variables that affect daily output.

But of this you can be certain . . . on any given job the new "PAY-LOADER" tractor-shovels will deliver more yards per day than any

comparable size tractor-shovel . . . and will do so continuously shift after shift.

The knowledge and experience gained in building thousands of tractor-shovels over the past 30 years is your assurance that a "PAYLOADER" is superior in design, engineering and performance . . . that it will outperform and outproduce any other comparable unit on any job.

So don't be deceived by "box-car" yardage figures . . . take a close look at the "PAYLOADER" . . . on *your* job . . . and you be the judge. Your "PAYLOADER" distributor will be happy to arrange a demonstration at your convenience.

THE FRANK G. HOUGH CO. 761 Sunnyside Ave., Libertyville, Ill.

Send data on 4-wheel-drive "PAYLOADER" tractor-shovels as checked

- ☐ HO (2¼ yd. payload, 1¾ yd. struck)
- ☐ HH (1¾ yd. payload, 1-1/3 yd. struck)
- ☐ HU (1-1/3 yd. payload, 1 yd. struck)

Name _____
Title _____
Company _____
Street _____
City _____
State _____ 7



PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY



Greenlee Bolt Hole Treaters

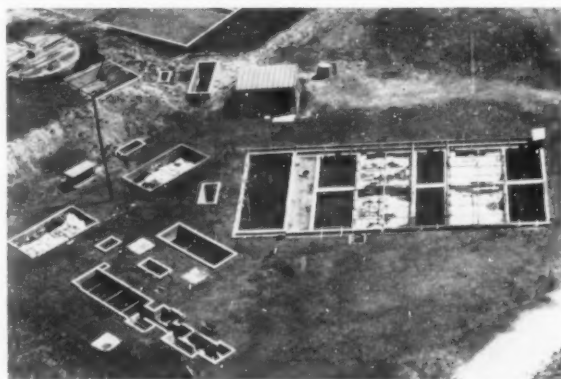


assure maximum life for poles, piles, timbers

Prevent decay around holes bored in new or old poles and timbers by pressure-treating each hole bored in the field. It's a simple operation with a GREENLEE Bolt Hole Treater. Treats the entire hole . . . forces preservative into all the wood cells around the bolt hole. Simply pour preservative in Treater cup until hole and cup are full. Pull back on handle, spring return does the work. Two models. Write for details, Greenlee Bros. & Co., 1752 23rd Avenue, Rockford, Illinois.



Hays Submerged Contact Aeration



City of McGregor, Texas. Original plant built in 1939, and enlarged to 5,500 population in 1955. Design: 380,000 g.p.d., 0.17 lb. BOD per capita.

IDEAL for SMALL CITIES, SUBDIVISIONS, INSTITUTIONS

8 outstanding advantages make it to YOUR advantage to investigate Hays Process first. Since 1938 A PROVEN PROCESS

For fully descriptive literature Engineers are invited to address:

HAYS PROCESS COMPANY

P. O. Box 768, Waco, Texas

We expect to extend our airport runways from 7,800 to 10,000 feet and to make many other improvements at the airport.

Kenneth K. King,
Public Works Director,
Phoenix, Ariz.

SANITARY ENGINEERING IN THE WEST PACIFIC

You will be interested to know that, after four years in the Western Pacific, definite signs of progress in the field of environmental sanitation are being noted. Many countries in the area have now become interested in the possibility of using sanitary and public health engineers in their public health set-up. We now have a post-graduate course in Public Health Engineering at the Institute of Hygiene of the University of the Philippines. We have been assisting Japan in a project for utilization of nightsoil and urban organic wastes by composting for the production of fertilizers. A pilot operation was carried on for over a year, and a fullscale prototype plant is now in operation in Kobe, Japan. The results of this operation, as well as other composting processes in Asia were discussed at a WHO seminar held in Taiwan in October.

In Taiwan, the Government has set up an Institute of Environmental Sanitation, which was one of the recommendations of our office. It is still in a rather early stage but is already making encouraging progress. In the Philippines, a WHO Public Health Engineer is assisting the Government in strengthening their central services and has been instrumental in stimulating the Government to produce a long-range plan for environmental sanitation. In North Borneo, we are just completing assistance to that Government in the design of water-borne sewerage schemes for small urban communities of that country. In Vietnam, we will be assisting the Government in a manner similar to that of the Philippines. Another program for assistance to the Kingdom of Tonga will be implemented this coming year by sending a public health engineer and a social anthropologist to that country. We also plan to have two more zonal seminars during 1957, one of which will cover the middle group of Western Pacific Countries and the other, the southern group.

Paul Bierstein,
Regional Adviser
Environmental Sanitation,
WHO, Manila, P. I.

Allis-Chalmers HD-11G Tractor Shovel

PREPARES GARBAGE PLOT FOR GARDEN SPOT



The wide HD-11G shovel (almost 8 ft) is used as a dozer blade to spread refuse. There's 32,000 lb of weight on almost 24 sq ft of track to insure desired compaction of the trash.



Fill material (more than 2 yd at a bite) is scooped out surely and swiftly. The 105-belt-hp Allis-Chalmers diesel engine furnishes plenty of power for traction and hydraulics. Extra-long tracks maintain balance, even with capacity loads.

Garbage disappears under a layer of earth — closing the door to vermin, insects and odors. Before long, Austin residents will have increased recreation facilities where this HD-11G is working.



One of the sanitary landfills operated by the city of Austin, Texas, is located next to a city park. Here's where Austin's new Allis-Chalmers HD-11G tractor shovel is busy handling up to 120 tons of garbage daily. Spreading, covering, compacting, the hard-working 11G tidies up the landscape burying garbage, reclaiming the area for additional park acreage.

Gravel pits, privately owned, are being used by the city at no charge in other reclamation projects. These pits will be filled, improved and the land returned to owners greatly increased in value.

Check the advantages of using Allis-Chalmers crawler tractor equipment at your fill area. Advanced-design features, versatility and production ability make them suitable for all sanitary landfill jobs. See your Allis-Chalmers construction machinery dealer. He will give you details and help you select the right unit for your needs from the complete Allis-Chalmers line.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION,
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS 

TFFI UNDERDRAINS *are used in* Trickling Filters *on the* OHIO TURNPIKE

At service plaza installations along the great new Ohio Turnpike are eight sewage treatment plants equipped with sixteen 48-foot trickling filters, with TFFI specification vitrified clay underdrains.

Just as the finest engineering went into the Turnpike, the same highest levels of engineering thought arrived at the selection of trickling filters, their equipment and materials.

because

Among the six great advantages of trickling filters are **FLEXIBILITY**, permitting a wide range of sewage flows without reduction of treatment efficiency.

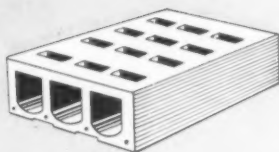
The sewage at the Turnpike installations has

approximately twice normal BOD content and is high in grease and detergents yet trickling filters will give uniformly good results and require little operating attention. Other advantages include low cost, long life, and overloads will present no problems.

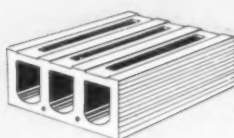
TFFI SPECIFICATIONS

For underdrains are contained in pages 37 and 38 of the **TRICKLING FILTER HANDBOOK**, under "Standard Specifications for Vitrified Clay Filter Blocks for Trickling Filters." Available from any TFFI member.

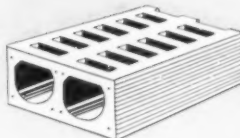
TRICKLING FILTER



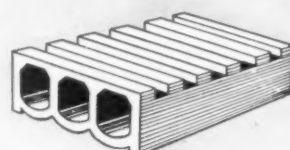
DICKEY
W. S. Dickey Clay Mfg. Co.
902 Walnut St.
Kansas City 6, Mo.



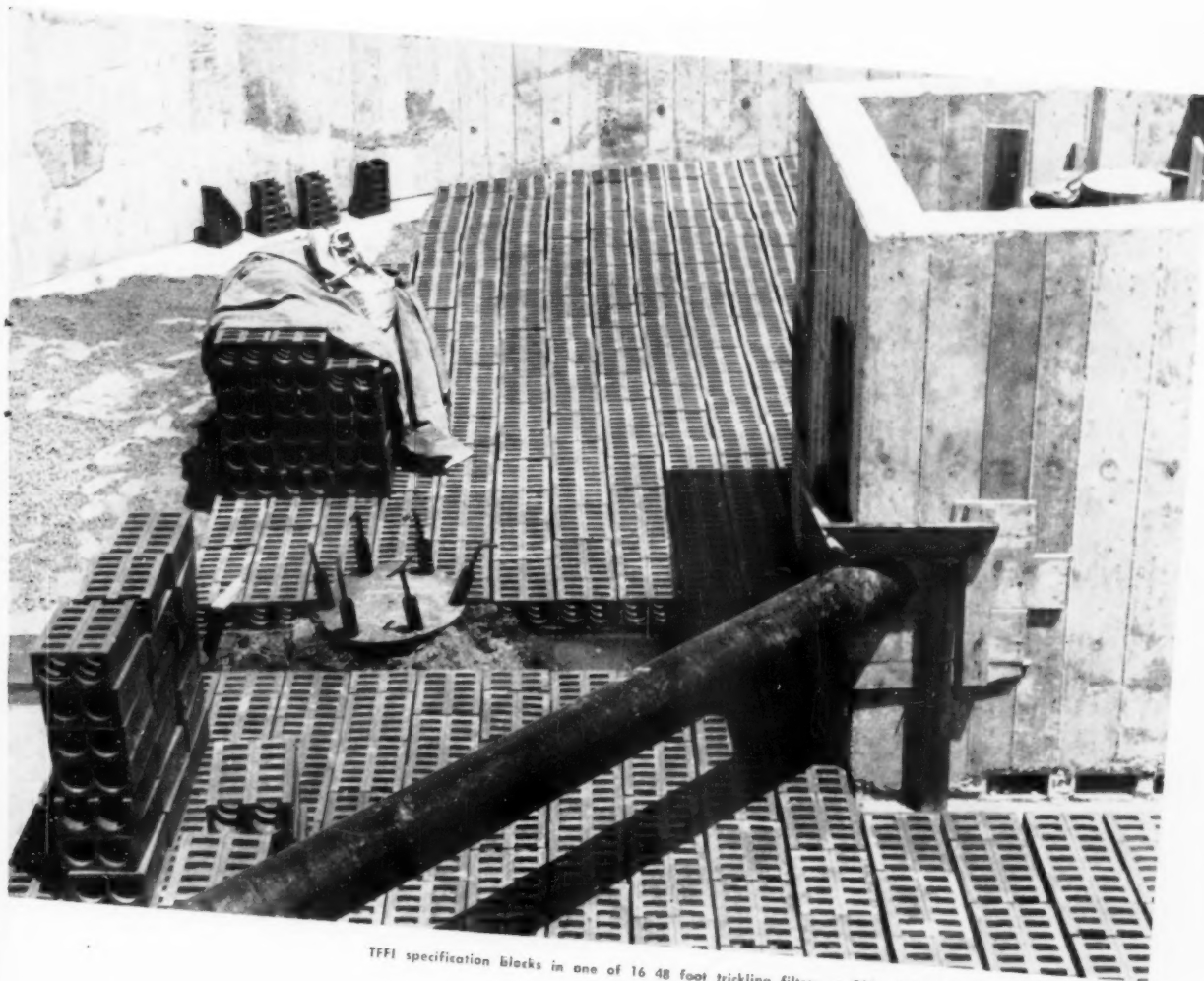
POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.



ARMCRE
Ayer-McCord Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas.



TFFI specification blocks in one of 16 48 foot trickling filters at Ohio Turnpike Service Plaza installations



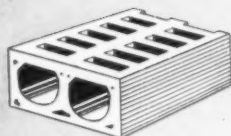
Designed by Finkbeiner, Pettis & Strout, Toledo 4, Ohio

Clarifiers and Rotary Distributors, Dorr-Oliver, Inc.; Chlorinators, Wallace & Tiernan Co. and Fischer & Porter.

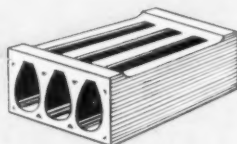
Equipment Comminutors by Chicago Pump Co. and Infilco, Inc. Pumps, Weinman Pump Mfg. Co.;

Construction by Thompson-Starrett Co., Chicago; Mosser Construction Inc., Fremont, Ohio; Christopher Construction Co., Columbus.

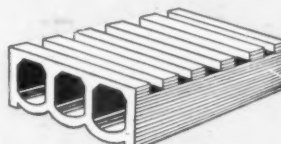
FLOOR INSTITUTE



BOSCO
Bowerston Shale Co.
Bowerston, Ohio



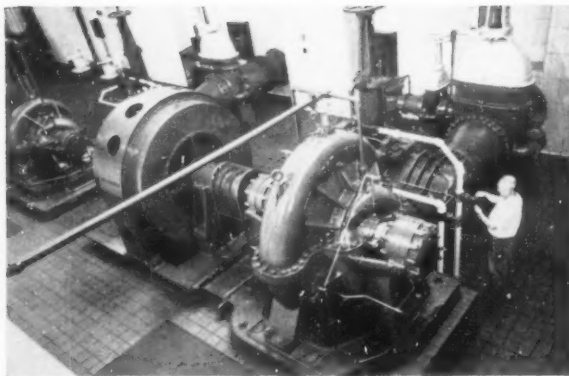
NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



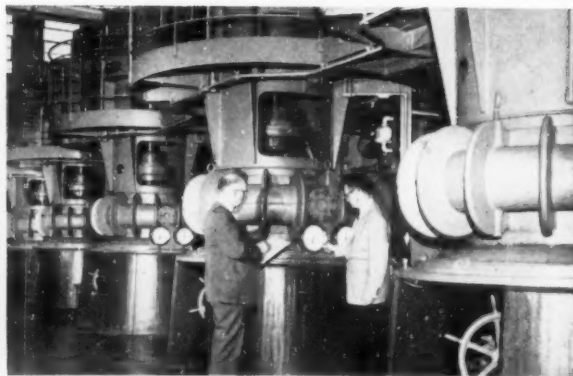
TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.



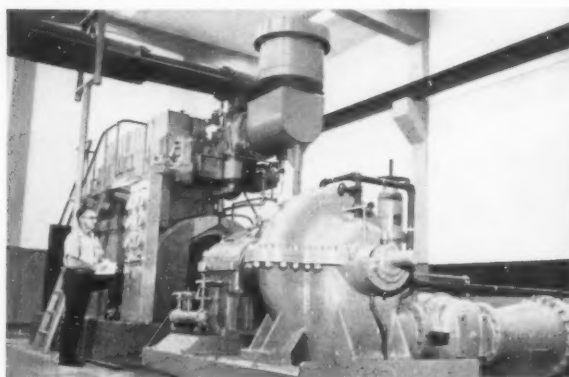
Symbol of
good treatment



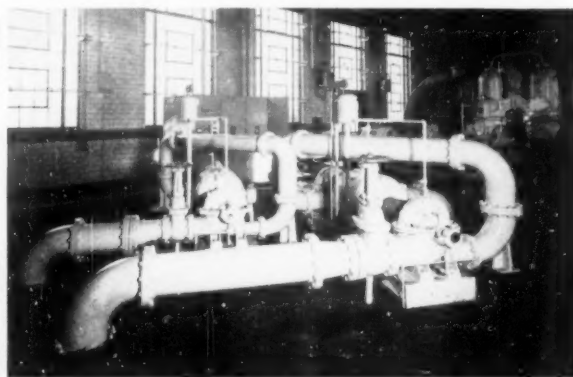
PHILADELPHIA, PA. One of ten Worthington high lift centrifugal pumps at the Torresdale Pumping Station. Capacity of this pump is 40 MGD.



NIAGARA FALLS, N. Y. Worthington high lift pumps in the Water Filtration Plant. In all, there are ten Worthington pumps, 15 to 30 MGD each.



MIAMI, FLA. One of four Worthington 15 MGD pumps driven by a Worthington diesel engine at the new Alexander Orr, Jr., Water Treatment Plant.



SHARON, PA. Two Worthington two-stage centrifugal pumps at the Sharon Valley Water Company. Capacity of the units is 2 MGD and 4 MGD each.

Reliability proved a thousand times a day

**You benefit 3 ways when you deal with Worthington—
world's leading builder of water works equipment**

High output and low costs. Literally thousands of municipalities from the smallest to the largest have found that they get high volume output and low operating costs when they install water works equipment by Worthington. Every day, the reliability of this equipment is thoroughly proved in installations like those pictured here.

An unbiased recommendation. Because Worthington makes all types of pumps and drives, you get the advantage of an equipment recommendation based on a broad look at all available ways of doing the job. Trained specialists will help you analyze your requirements and select the proper equipment.

Unit responsibility. You do business with one company—eliminating

delays and inconvenience that can occur when you are forced to co-ordinate the efforts of several suppliers. Unit responsibility by Worthington saves you time and money.

Some of the water works equipment built by Worthington include: horizontal and vertical centrifugal pumps; vertical turbine pumps; diesel, gas and dual fuel engines; steam turbines; speed increasing gears; and water meters.

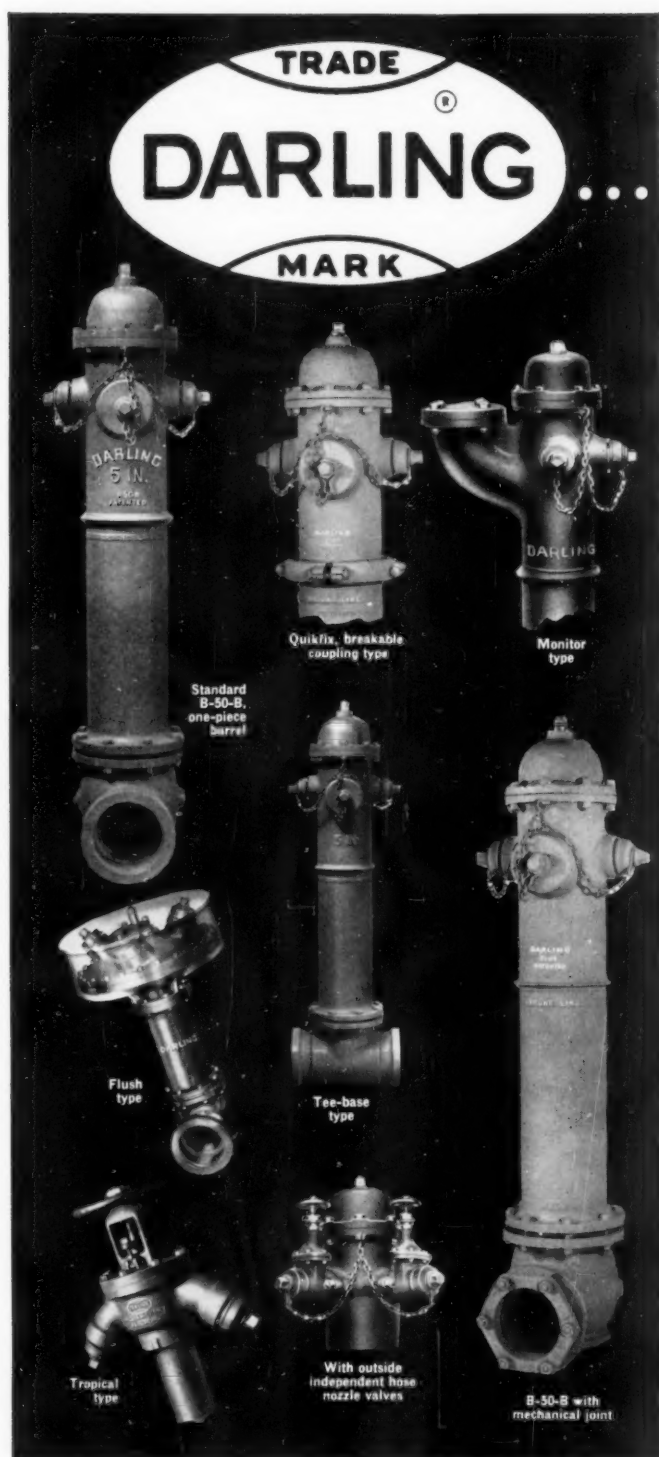
For more information on any of these products, call your nearest Worthington District Office, or write Section W66, Worthington Corporation, Public Works Department, Harrison, N. J. In Canada: Worthington (Canada) 1955, Ltd., Toronto, Ont.

W 6.5

WORTHINGTON



ALL MAJOR PUBLIC WORKS EQUIPMENT UNDER ONE RESPONSIBILITY



DARLING VALVE & MANUFACTURING CO.

Williamsport 22, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

PUBLIC WORKS for March, 1957

HYDRANTS

- Featuring new ball-bearing operated B-50-B design
- Types and sizes for every requirement

YOU'LL be ahead on many counts when you specify modern Darling Fire Hydrants. Just for example . . .

Your system can include hydrant types exactly right for special or unusual service needs — breakable coupling types where traffic damage is common, concealed flush types for airport and pavement installation, Tee-base types to eliminate lateral connections where practicable. These and a few of the other types are shown here.

Equally important, Darling's unique B-50-B development (now available in all except the Tropical type) introduces *ball-bearing* operation combined with "O" ring seals. Result: a packless, dry-top hydrant. No packing gland maintenance. Operating threads and bearings *stay* lubricated and water can't reach them. Operation is far easier, far faster . . . and you avoid lots of maintenance time and trouble.

Send for complete information. Better still, ask to have a Darling engineer check your needs and tell you just what you stand to gain with Darling Hydrants.



FREE

EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

Case Histories of the Combination Tractair-Air Compressor

585. Four Tractair case histories are covered in this literature issued by the Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wisc. They are printed in three colors and using illustrations, describe the all-purpose Tractair as used on air application jobs, with or without the more than a dozen attachments available. Check the reply card.

Concrete Control Equipment and Methods

556. "Uniform Concrete", describing the latest (SC)² precision concrete control equipment methods and results that can be obtained by its use is available from Scientific Concrete Service Corp., 724 Salem Ave., Elizabeth 3, N. J. For information on everything needed for concrete batching for plants of all sizes, check the reply card.

Zeolite Water Softeners End Hard Water Troubles

587. A 20-page catalog on Permutit water softeners has been released by The Permutit Co., 330 West 42nd St., New York 36, N. Y. Schematic diagrams, chemical reactions, operation of the water softener and specifications are some of the sections covered. Check the reply card today.

PR System of Coordinated Traffic Signal Control

589. This bulletin describes the PR local controller which carries out the directions of the Electro-Matic Master in the all-electronic equipment for coordinated traffic signal operation. Check the reply card or write Automatic Signal Div., Eastern Industries, Inc., Norwalk, Conn., for this valuable bulletin.

Diatomite Filters in Water Filtration

596. A new line of IWF diatomite filters is featured in this 10-page Bulletin 651 by the R. P. Adams Co., Inc., 328 East Park Drive, Buffalo 17, N. Y. The IWF is ideal for medium and small town water supplies and the bulletin provides installation drawings, sectional views and operational sketches. Check the reply card for your copy of this helpful bulletin.

Electronic Weighing Equipment For Moving or Stopped Vehicles

597. Weigh moving vehicles electronically with the dynamic axle scale and stopped vehicles with the precision static scale. Complete specifications, method of operation, installation and capacities are described fully in literature available from Teller & Cooper, Inc., 75 Front St., Brooklyn 1, N. Y., or by checking the reply card.

Flocculating Aid for Water and Waste Treatment

602. Separan 2610, a synthetic organic chemical, has been found effective in reducing the cost of chemicals required in the flocculation of industrial process and cooling water, sewage and industrial wastes. Bulletins giving complete information concerning the application of the chemical and results obtained in several specific examples are available as Nos. 164-38 and 164-39 issued by the Dow Chemical Co. of Midland, Michigan, and may be obtained by checking the reply card.

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Tracto-Loaders For Fast Material Handling and Excavating

600. Tracto-Loaders with capacities from $\frac{1}{4}$ cu. yd. to $1\frac{1}{4}$ cu. yd. are described fully in a 2-color catalog available from Tractomotive Corp., Deerfield, Ill. General purpose material handling and excavating loading in confined areas are jobs performed by these machines. Check the reply card.

Survey Marking and Identification Equipment

601. Surveyor stakes, identification caps and monument markers are described fully in literature available from Bathory Mfg. Co., Plymouth, Mich. Price schedules and descriptions are included. Check the reply card today.

V-Notch Chlorinators For Water and Sewage Plants



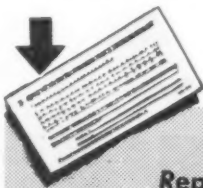
and electrical requirements are described in the technical data section. For your copies, check the reply card.

Complete Line of Earth Boring Machines

591. A 16-page illustrated catalog on the Hydrauger line of boring machines has been released. Field operation photos and views showing embankment drainage and pipe line installation are included in this material available from Hydrauger Corp., Ltd., 681 Market St., San Francisco, Calif.

Catalog on John Deere Tractors and Equipment

588. Information and specifications on the John Deere "420" crawler and industrial tractors are fully covered in catalog from Deere & Co., 3300 River Drive, Moline, Ill. Attachments such as snow plow blades, rear-mounted blades, mowers and angling dozers are described. Check the reply card.



Use the
Reply Cards
Inside Front Cover

New Traxcavators For New Profits

592. This 8-page booklet explains how Caterpillar's three new Traxcavators, the No. 933, No. 955, and No. 977, have been designed and built to deliver higher production over a longer period. Performance factors such as stability, bucket capacity, power and speed are discussed. Check the reply card or write Caterpillar Tractor Co., Peoria, Ill., for your copy.

Chemical Resistant Pipe, Fittings and Valves

593. Complete data about the Van-Cor line of unplasticized polyvinyl chloride pipe, fittings and valves are given in a 16-page engineering catalog published by Colonial Plastics Mfg. Co., 2685 East 79th St., Cleveland 4, Ohio. Contents include physical properties, chemical resistance tables, fitting and valve dimensions and flow rate charts. Check the reply card.

Vacuum Cleaner and Leaf Collector For Cleaner Streets

595. A unit is now available that can be mounted on a right-hand drive jeep or a pick-up truck for picking up gutter trash and leaves. Complete specifications, capacity, operation and installation procedures are covered in a bulletin available from Tarrant Mfg. Co., Saratoga Springs, N. Y., or can be obtained by checking the reply card.

MORE LISTINGS ON PAGES 34 TO 48

Asbestos-Cement Sewer Pipe and Pressure Pipe

594. Literature on the Italtit asbestos cement sewer pipe and monolithic fittings with sizes of 5" to 12" with bell and spigot couplings and 14" to 48" with Simplex couplings is available. Also, information on pressure pipe from 3" to 12" with the Simplex coupling is included. Check the reply card or write Italtit Inc., 620 Fifth Ave., N. Y. 20, N. Y., for your bulletin.

What You Should Know About Vitrified Clay Products

598. A completely new 4-page technical bulletin entitled "Vitrified Clay Products" is available from Robinson Clay Product Co., 65 West State St., Akron 9, Ohio. Designed for quick reference, the illustrated bulletin contains complete data on specifications and dimensions for clay pipe, liner plates, flue lining, coping, perforated pipe and terrace tile. Check the reply card.

Keep Crews Busy During the Winter Months

599. Make your own precast and prestressed concrete I-beams, bridge decks, joists, piles and girders during the winter months. Check the reply card for a bulletin describing inexpensive new forms for precision manufacturing of precast concrete double-tee slabs just released by Irvington Form and Tank Corp., 20 Vesey St., New York 7, N. Y.



Wayne Richardson

L. E. Cunningham

"Here's why our city installed its sixth BJ Submersible"

*Says L. E. Cunningham,
Mayor of this
progressive
midwestern city*

WELCOME TO BELVIDERE ILLINOIS CITY OF INDUSTRIAL ADVANTAGES

Facts about Belvidere, Illinois

A friendly city of 10,000, Belvidere is located 75 miles northwest of Chicago. Its industrial advantages include abundance of water, skilled labor pool, good plant sites, low tax and utility rates, and excellent educational and recreational facilities. It is served by the Chicago and Northwestern Railroad and 26 major truck lines.

Facts about the BJ Submersible

The BJ Submersible operates completely submerged in water at any depth. This sealed, submerged unit needs no pump house and is unaffected by weather extremes, floods or dust. The BJ Submersible requires no field adjustments. Normally gives more than 20 thousand pumping hours before service is required. Silent and vibrationless.

"A dependable, protected water supply system is vital to the future growth of both our residential and industrial areas.

In the past our wells were pumped by surface motor deepwell turbines requiring pump house protection and special maintenance. In 1951 Wayne Richardson, our Waterworks Superintendent, working with R. Anderson, Engineering, replaced an old deepwell turbine with a modern Byron Jackson Submersible.

Our experience with this completely submerged pump was so satisfactory that we converted all our wells to submersible operation, having just completed the installation of the sixth unit. The combined capacity of all these units is now 5 MGD with storage facilities for 1,700,000 gallons.

The people of Belvidere are now assured a pure water supply that is completely safe from flood or other disaster conditions. And our people also benefit as taxpayers since routine maintenance is eliminated and no costly, space-consuming surface structures are necessary. Byron Jackson Submersibles have provided us with the answer to all our pumping problems."

SINCE **BJ** 1872

Byron Jackson Pumps
Incorporated

A Subsidiary of Borg-Warner Corporation
P. O. Box 2017A, Terminal Annex • Los Angeles 54, California

To order these helpful booklets check the reply card inside front cover.

NEW LISTINGS (Cont.)

Manhole, Water or Gas Valve Box Locator

603. A valve box locator or manhole finder is available from Aqua Survey & Instrument Co., 2012 Leslie Ave., Cincinnati 12, Ohio. Rugged and compact with no wires, batteries or switches, the Aqua box locator should be in every service car. For more information and price, check the reply card.

Sludge Digestion Time Reduced

604. The Catalytic Reduction Process may be applied to reduce the period required for biological sludge digestion by permitting increased solids loading. It may be used for new plants or adapted to existing overloaded digesters. Bulletin 145, Chicago Pump Co., 422 Diversey Parkway, Chicago 14, Ill., discusses application of the process. Check the reply card.

WATER WORKS

Elevated Tanks and Other Storage Facilities

32. How engineers' designs and standard AWWA specifications are followed for fabrication and erection of water storage facilities are described in color illustrated booklet. Address the Darby Corp., Kansas City, Kans., or use the handy reply card.

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes. Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A, Chicago 80, Ill. Check the reply card.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Handbook of Cast Iron Pipes and Fittings

52. Full engineering data on products of the Alabama Pipe Co., including Super De Lavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference. Requests for this valuable publication should be accompanied by your business letterhead.

Engineering Data on Tilting Disc Check Valves

196. The Chapman tilting disc check valve is designed to lift away from the body seat without sliding or wearing; closes without slamming. Operating principles, details of construction, dimensions, recommendations and engineering data are fully covered in 18-page Bulletin No. 30. Get your copy by checking the reply card or write to Chapman Valve Mfg. Co., Indian Orchard, Mass.

What You Should Know About The Centrline Process

197. The Centrline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centrline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economics of this process. The Tate process for lining smaller mains is also covered. Check reply card for your copy.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Semi-Automatic and Step Control Chlorine Feeding

160. A bulletin, complete with photographs and typical installation and control arrangement diagrams has been released by Builders-Providence, Inc., Providence, R. I. Applications of semi-automatic and step control chlorine feeding are discussed and the main advantages are included. For your copy check the reply card.

Data Offered on Elevated Steel Tanks

166. Attractive designs for elevated steel water storage tanks are shown in bulletins of R. D. Cole Mfg. Co., Newman, Georgia. For copies of latest literature check reply card.

All-Electric Floatless Liquid Level Control

174. Description of operating principles and application of B/W controls show the simplicity and many uses of these all-electric, floatless devices. Get latest bulletins for engineering data, diagrams of typical installations and details of component parts. Check the reply card or write B/W Controller Corp., Dept. PW, Birmingham, Mich.

A Northeast Steel Top Cab Keeps Your Tractor Working Year 'round

- Operating Controls Inside
- Roll-up or Snap-off Curtains

- Full Vision In All Directions
- Safety Glass Windshield and Skylight

Don't let bad weather shut down your jobs... a Northeast Cab assures operator comfort Winter or Summer... keeps your tractor earning every day, every season. Cabs are custom built for each tractor model to fit snugly and provide maximum protection from cold, wind, rain and snow. Heavy gauge steel top and supports with heavy-duty water resistant canvas side and rear curtains. Safety glass windshield and skylight mounted in rubber and aluminum frames... side windows of heavy gauge, crystal clear Vinyl plastic. Windshield wiper is standard. Cabs are packed in kit form, complete in every detail... no hidden extras to buy... easily and quickly installed. Write direct for details and prices, indicating tractor you own, or see your tractor dealer today.



Universal Mounting

Each cab is designed to fit the tractor itself and the most popular makes of front end loaders, back-hoes or any combination of front and rear mounted equipment you now own or may add later. One Northeast cab enables you to use all your equipment.

Designed For

Ford Tractors

Fordson Major

I-H, 300-400-600

Ferguson 20-30-35-40

Oliver 55

Sherman Fork Lift

TerraTrac

John Deere

and the Allied Equipment - Front and Rear Mounted

Northeast Equipment, Inc.

9 Brookfield Street Worcester, Mass.

FAST INSTALLATION . . . NO JOINT LEAKS . . . LONG LIFE



with **TYLOX-Jointed** **UNITED STATES** **CONCRETE PIPE**

PROJECT: Storm sewer for City of Ft. Lauderdale, Fla.

ENGINEER: E. L. Patterson, City Engineer, Ft. Lauderdale, Fla.

CONTRACTOR: Inter-County Construction Co., Ft. Lauderdale, Fla.

PIPE: 66" reinforced concrete, manufactured at Ft. Lauderdale, Florida plant of United States Concrete Pipe Co.

QUALITY — Concrete pipe of great strength for safety under tough conditions, dense structure for sustained high load carrying capacity, and durability for long life . . . yet the cost is low. When furnished with TYLOX Flexible Couplings, faster pipe-laying reduces job costs and assures tight joints.

SERVICE — Prompt deliveries of all concrete pipe types and sizes, right to the job site. Conveniently located sales offices and pipe plants place this service near you. To expand the area we serve, a new concrete pipe plant has recently been opened in Ft. Lauderdale, Fla.

6024

UNITED STATES CONCRETE PIPE Co. **UNIVERSAL SEWER PIPE CORPORATION**

PRODUCTS

Vitrified Clay Pipe with Tylox Flexible Couplings,
Vitrified Clay Liner Plates, Ship Lap Wall Coping
and other Clay Products, Concrete Pipe.

SALES OFFICES

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Philadelphia, Pa.	Tel. EN-6015
P. O. Box 30, Bristol, Pa.	Tel. ST-8-5571
Cincinnati, Ohio—P. O. Newtown, Ohio, Box 215	Tel. LO-1-7846
Ft. Lauderdale, Fla.—P. O. Box 958	Tel. JA-4-8461

GENERAL OFFICES • 1500 Union Commerce Bldg. • Cleveland 14, Ohio • Tel. Main 1-5240

PUBLIC WORKS for December, 1956

To order these helpful booklets check the reply card inside front cover.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Does Your Water Works Have Standby Power?

224. Climax Engines are used in Municipal Water Works to supply dependable power during emergencies. They are available in a range of sizes from 40 to 600 HP and operate on either natural gas, butane, gasoline or a combination of these fuels. Use the handy reply card to obtain complete details and literature from Climax Engine & Pump Co., 208 S. La Salle St., Chicago 4, Illinois.

Valuable Information on Water And Waste Treatment Instrumentation

229. Helpful data on pneumatic instrumentation, flow measurement, recording controllers and rapid sand filter control systems are included in a 16-page Bulletin 1-15. Get this from the Foxboro Co., Foxboro, Mass., or by checking the handy reply card.

Helpful Valve Catalog For Engineers

236. For complete descriptions of Darling double disc, parallel seat gate valves be sure to get Bulletin 5403 issued by Darling Valve & Mfg. Co., Williamsport, Pa. Construction details covering all valve parts and accessories are helpful for specification writers. Check the reply card for your copy.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

Bell and Spigot Joint Leaks Quickly Repaired

214. Broken water main can quickly be repaired when you have "Skinner-Seal" Bell Joint Clamps on hand. Leaky bell and spigot joints are made lastingly tight with Skinner-Seal Bell Joint Clamps. Get Skinner Catalog GW now—this handsome 48-page book shows how to make every type of pipe repair and covers a complete line of clamps to do the job quickly and easily. Just check the reply card for your copy.

Attractive Bulletin Features Large Elevated Tanks

252. In a 24-page booklet "Horton Elevated Steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Hortonspheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check reply card for your copy.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 1246 from Norton Co., Worcester 6, Mass. by checking the reply card.

Here's Help for Laboratory Planning

369. A comprehensive laboratory planning guide that tells the engineer and designer how to obtain maximum space economy; utilize new and present facilities; and use functional design in locating utilities, ventilation and lighting is now available from Metalab Equipment Corp., Hicksville, L. I., N. Y. Complete data includes sectional and interchangeable lab equipment, furniture and accessories. Check the reply card for this valuable planning aid.

Information on Prestressed Concrete Tanks

249. New 4-page technical Bulletin T-12 describes current trends in the design and construction of prestressed concrete tanks, including illustrations of typical tanks and standpipes. Check the reply card or write The Preload Co., Inc., 211 East 37th St., New York 16, N. Y.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the reply card.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wisconsin.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the reply card.

Friction Loss of Head Chart and Flow Powergraph

450. A convenient means of determining friction loss of head and power required to compensate for it. Combines a 2-page loss of head chart with a 1-page powergraph. Data derived from the William and Hazen Formula. Available from Johns-Manville, 22 East 40th St., New York 16, N. Y., or by checking the reply card.



CUT MAINTENANCE COST in HALF with GRACE 'EZ-ON' TRAFFIC SIGN FACES:

'EZ-ON' Sign Faces—patented, are made of 30 ga. steel in 3 shapes and 3 sizes—octagon, diamond, rectangular—24" and 30" and 18" x 24". The former in red and yellow, the latter in white only. Standard copy or special—on the rectangular Face blank if you wish. They meet every need—at 1/2 the regular cost!

3 SHAPES... 3 SIZES!



OCTAGON
24"
30"



RECTANGULAR 24"



DIAMOND
18"
24"

'EZ-ON' Faces slip on right over your present signs—in less than 5 minutes—hence your signs are never out of service. Used by cities and Highway Dept's, all over the United States.





1. Slip 'EZ-ON' Face over old sign. Note wide flanges.
2. Then bend flanges backward holding 'EZ-ON' Face in place.
3. Use Crimping Tool to clamp flange and secure Sign Face.

GRACE 'EZ-ON' Sign Faces are reflectorized and meet all specifications for brilliance and reflective qualities. INVESTIGATE . . . and save. Their cost is HALF that of ordinary signs! SEND FOR SAMPLE SIGN. Dept. WP

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THE PRESSURE IS ON!

Expanded areas of skyscrapers . . . Super highways with their multi-ton trucks and busses . . . Longer water hauls and greater pressure demands from industry and urban areas have put the pressure on! But pressure is part of our business, manufacturing Cast Iron Pipe . . . the pipe that has withstood pressure, stress and strain and rugged treatment for more than a century.

You can be assured with Alabama's Super De Laud Cast Iron Pipe. In sizes of 3" to 24" in modern long lengths . . . Bell and Spigot, Roll on Joint, Mechanical Joint and Flanged.

ALABAMA PIPE COMPANY

We invite inquiries to our nearest sales office—

122 So. Michigan Avenue
Chicago 3, Ill.

350 Fifth Avenue
New York 1, New York

General Sales Offices
ANNISTON, ALABAMA

*Never-say-die dependability . . .
proved on the Alcan Highway!*



The Alcan test run was supervised and certified by the AAA.

NEW TASK-FORCE 57 CHEVROLET TRUCKS

Six new '57 Chevy trucks tamed the rugged Alcan in one round-the-clock sprint. They covered the grueling run (normally a 72-hour trip) in less than 45 hours to prove their durability!

They took everything the truck-killing Alcan could dish out—and not a single unit dropped out or turned back due to mechanical failure! They turned in top scores for performance and economy, too! Look over the Alcan Highway Champs at your Chevrolet dealer's. . . Chevrolet Division of General Motors, Detroit 2, Michigan.



NO JOB TOO TOUGH FOR THE ALCAN CHAMPS!

You get Alcan-proved dependability in whatever light- or medium-duty model you choose. Put a new Chevy to work for you and take advantage of its extra stamina, its time- and money-saving ways!

PROVED ON THE ALCAN HIGHWAY . . . CHAMPS OF EVERY WEIGHT CLASS!



To order these helpful booklets check the reply card inside front cover.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLaund centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

What You Should Know About the Rubber Waterstop

448. A bulletin on the Serviced rubber waterstop has been released by Serviced Products Corp., 6051 West 65th St., Chicago 38, Ill. General information, engineering service, advantages of specifying the waterstop, specifications, general and detail requirements, installation and typical applications, standard sizes and types are fully covered. Check the reply card for your copy.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing. Check the reply card for this interesting literature.

Bulletin On Locating Trouble in Pumps

533. A bulletin to help locate and correct common ailments of rotary, centrifugal and steam pumps has been released by Worthington Corp., Merchandising Sales Dept., Harrison, N. J. Pictures give a full description of pump troubles—from failure to deliver water to the loss of capacity after starting. For copies check the reply card.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches. Check the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Valuable Bulletin on Rodney Hunt Sluice Gate

61. Sluice gate seats on a resilient rubber seal flush with the bottom of the channel and eliminates bottom wedges and the trough in which they descend. Gives design flexibility in water filtration, sewage treatment and sluices, dam, channel and chamber flow control. For complete details write to Rodney Hunt Machine Co., 82 Lake Street, Orange, Mass. for Bulletin 75, or check the reply card.

Electric Power Wherever You Need It

75. Electric power for every job—for construction, maintenance and emergencies—is always available for the owner of a convenient Homelite carryable generator. These compact gasoline engine operated units are made in a variety of sizes to suit every power requirement. Get full details by writing Homelite Div. of Textron Inc., Port Chester, N. Y., or check the reply card.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking the reply card.

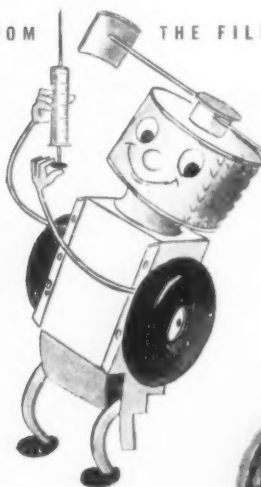
Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use reply card or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

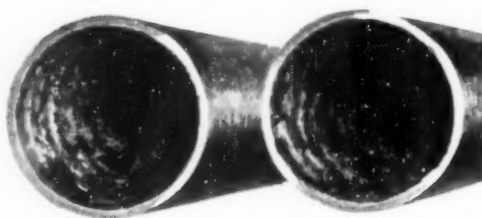
Mechanical Joint Principle Applied to Sewer Pipe

101. The Amvrit joint forms a tight compression seal between bell and spigot rings, prevents infiltration and stops root intrusion. Get data on Amvrit jointed vitrified clay pipe from American Vitrified Products Co., Cleveland, Ohio. Check the reply card.

FROM THE FILES OF DR. CENTRILINE...



"Hmmm-Leakage!"
This calls for
immediate
consultation"



CASE #1687

- PATIENT:** 5 miles of 62" and 36" steel water mains in St. Louis, Missouri.
- SYMPTOMS:** Leakage repair costs on the increase from 1936 to 1947.
- DIAGNOSIS:** External corrosion causing pitting through the pipe wall.
- TREATMENT:** In 1947, after consultation with Centriliner, pipelines were cleaned and cement-lined in place with a smooth, dense mortar lining by the Centriliner Process.
- RESULTS:** The dense cement lining stopped leakage, eliminating high maintenance costs. Savings represented 13% return on the cost of cleaning and lining.*

This lining has paid for itself in only 8 years. Not only was the leakage stopped but the carrying capacity was increased. If your problem is leakage in steel pipe ... or capacity reducing tuberculation in steel or cast iron water mains, consider the advantages of cement lining in place.

*From a paper written by Mr. John B. Dean, Division Engineer, Water Div., St. Louis, Mo.

CENTRILINE CORPORATION

A subsidiary of the Raymond Concrete Pile Company

140 Cedar Street, New York 6, N. Y.
WORTH 2-1429



Branch Offices in Principal Cities
of the United States,
Canada and Latin America

any thread you need !



MUELLER CORPORATION STOPS

A combination of practically any type inlet or outlet thread on Mueller Corporation Stops permits you to connect to any type main and run the service line best suited to your needs. You may have a requirement for connecting to thin walled pipe. For this purpose, use the Mueller compression joint inlet with either copper or increasing I.P. thread outlet. Mueller inlet threads form a strong mechanical connection to the main. The compression joint, composed of a rubber sealing ring encased in a copper retaining ring, is tightened down against the main to provide a pressure-tight seal. Check your particular requirements, then contact your Mueller Representative or write direct for complete information on the corporation stop that will fit your needs.

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

To order these helpful booklets check the reply card inside front cover.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit Netco Div., Clarke Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

Valuable Information on Underground Pumping Stations

246. The complete prefabricated underground pumping station is fully described in a bulletin just released by Zimmer & Franeson, 1715 Fifteenth Street Place, Moline, Ill. Construction features, corrosion control, electric controls, specifications, pumping equipment and installation are a few of the items covered. Check the reply card.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas.

Flexible Coupling Speeds Vitrified Pipe Installation

311. Fast pipe laying with chemically inert, leakproof joints is made easy by Universal vitrified pipe with Tylox rubber joints. Full information on these materials and pipe laying methods is available from Universal Sewer Pipe Corp., 1500 Union Commerce Bldg., Cleveland 14, Ohio. Check the reply card.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Data Offered on Water, Sewage and Waste Treatment Equipment

263. Equipment for sewage treatment, water purification and industrial waste treatment is described in a 16-page Book No. 2440, published by Link-Belt Co., Colmar, Pa. Case histories, photographs and schematic drawings are included. Straightline and Circuline collectors, Thru-Clean and Straightline bar screens, Tritor screens, flash mixers, scum breakers and other units are described.

Design and Applications of the Spiragester

419. The Spiragester is a combination of a clarifier and a digester in a single unit, compactly arranged for economical construction and ease of operation. Full data on operation, explicit design information and specifications are included in Bulletin 135, issued by Lakeside Engineering Corp., 222 West Adams, Chicago, Ill. Check the reply card for a copy.

For Prompt Service Use The Reply Card

Bulletins on Chlorine Gas Control Equipment

498. Sterelators, chlorine gas control equipment, for sewage plants, water works, swimming pools and industrial applications are described in bulletins available from Everson Mfg. Co., 214 W. Huron St., Chicago 10, Ill. Semi-Automatic and manual control flow charts are illustrated as well as typical layouts. Check the reply card.

Butterfly Valves For Water and Sewage Treatment Plants

507. Rubber seated butterfly valves are described and illustrated in a new two-color Bulletin No. 5603, available from F. B. Leopold Co., Inc., 227 So. Division St., Zelenople, Pa. Complete details on the performance and construction features of the valve are included. Check the reply card.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details get Bulletin SP-10 by writing to Western Machinery Co., 650 Fifth St., San Francisco 7, Calif., or check the reply card.

Dorr-Oliver Equipment & Methods For Modern Sewage Treatment

494. This 12-page, two-color bulletin describes the characteristics, types, sizes, applications and operation of Dorr-Oliver sewage treatment equipment and presents a number of typical plant flowsheets. Also included are photographs and line and wash drawings of various units. Copies are available by checking the reply card or from Dorr-Oliver, Inc., Barry Place, Stamford, Conn.

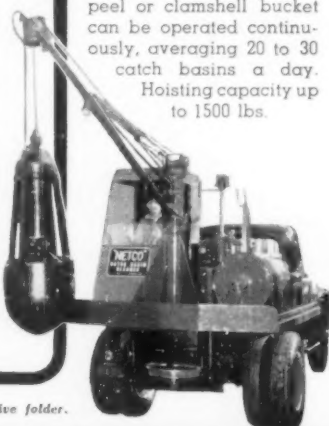
CONSTRUCTION EQUIPMENT AND MATERIALS

What You Should Know About Air-Placed Concrete

67. For a detailed explanation of the principle of "gunned" or "air-placed" concrete and description of the improved Model 750 and 1250 Bondactors, be sure to get your copy of Form 553 from Air Placement Equipment Co., 1011 W. 24th St., Kansas City 8, Mo. Check the reply card today.

New NETCO Catch Basin Cleaners are Working Throughout the Land in These Cities

Chicago, Illinois
Indianapolis, Ind.
Cumberland, Md.
Boston, Mass.
Fitchburg, Mass.
Lowell, Mass.
Grand Rapids, Mich.
Trenton, N. J.
Westfield, N. J.
Binghamton, N. Y.
City of N. Y., N. Y.
Utica, N. Y.
Parma, Ohio
Philadelphia, Pa.
Pa. Turnpike Comm.
Hamilton, Toronto
Canada



Easily mounted on any short wheel base truck with 8 ft. in back of the cab, the NETCO with orange peel or clamshell bucket can be operated continuously, averaging 20 to 30 catch basins a day. Hoisting capacity up to 1500 lbs.

Send for our 6 page descriptive folder.



NETCO DIVISION
CLARK-WILCOX COMPANY
118 Western Avenue
Boston 34, Massachusetts

ELEVATED STEEL TANKS

• Elevated Steel Tanks for water supply, ranging from 5,000 to 2,000,000 gallons—ranging from standard hemispherical self-supporting bottom to spherical tank on tubular tower.

Correctly built in accordance with AWWA specifications. Send us your inquiry, stating capacity, height to bottom and location. Established 1854. Write for Tank Talks.

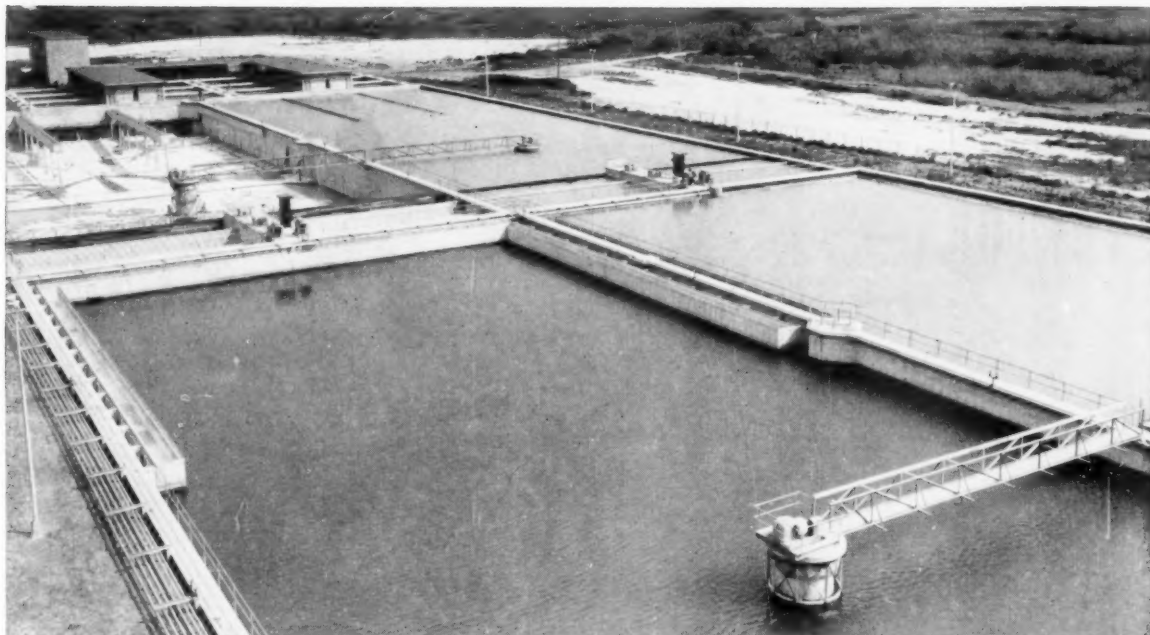


Elevated Tanks,
Pressure Vessels,
Chemical and
Processing
Equipment from
Aluminum,
Stainless and
Carbon Steel,
Monel and Other
Alloys.

Established 1854



R. D. COLE MANUFACTURING CO.
NEWNAN, GEORGIA



New 48-mgd filtration plant can handle 50% increase easily, 100% surge in emergencies. Consulting engineers: Reagan and McCaughan.

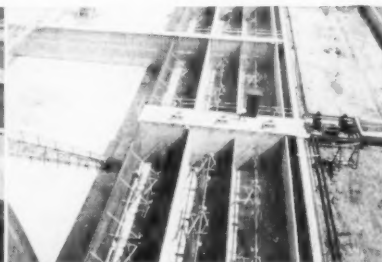
CORPUS CHRISTI, TEXAS

Produces pure, clear water from muddy Nueces River

with LINK-BELT collectors . . . mixers . . . chemical handling system



TYPE SC CIRCULINE SLUDGE COLLECTORS, with pivoted rakes at ends of arms, adjust to collect sludge in corners of basin.



STRAIGHTLINE SLOW MIXERS are used in primary and secondary chambers. Detention time: 45 minutes at 48 mgd capacity.



LINK-BELT SCREW CONVEYORS AND BUCKET ELEVATORS distribute lime, sulphate and alum to tanks for live or reserve storage.

WATER from the Nueces River supplying Corpus Christi is hard and muddy. To provide ample water for the rapidly expanding population—which has doubled each decade since 1920—treatment facilities featuring Link-Belt equipment were installed at the new O. N. Stevens water filtration plant. A two-stage treatment provides rapid and thorough solids removal . . . effectively reduces the river's 142 ppm hardness.

Link-Belt is supplying specific answers to specialized water, sewage and waste treatment problems for municipalities and industries throughout the country. A broad line of screens, collectors, mixers, conveyors and power transmission equipment offers durability

that minimizes maintenance . . . helps you plan your requirements for the years ahead.

Let our engineers work with you, your chemists and consultants to assure top efficiency at all flow conditions. Call your nearest Link-Belt office for consultation with a sanitary engineering specialist.

14,124

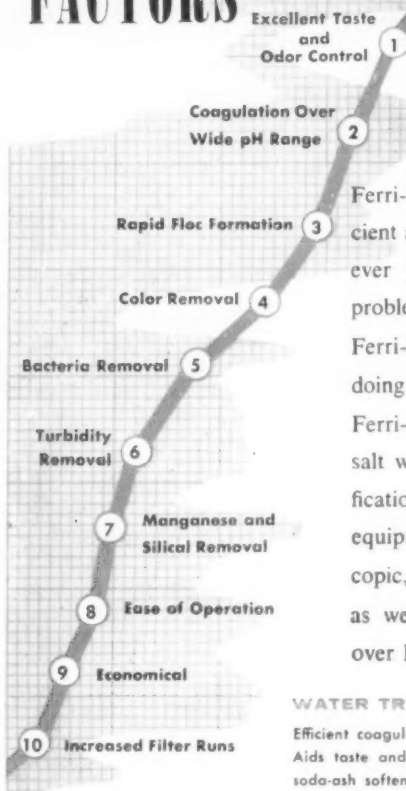
LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

To order these helpful booklets check the reply card inside front cover.

The Superior COAGULANT With the Plus FACTORS—



Ferri-Floc gives smoother, more efficient and trouble free operation. Whatever your particular water treatment problem may be, you can depend on Ferri-Floc doing a superior job and doing it efficiently and economically—Ferri-Floc is a free flowing granular salt which can be fed with few modifications through any standard dry feed equipment. It is only mildly hygroscopic, thereby permitting easy handling as well as storage in closed hoppers over long periods of time.

WATER TREATMENT

Efficient coagulation of surface or well waters. Aids taste and odor control—Effective in lime soda-ash softening. Adaptable to treatment of nearly all industrial waters.

SEWAGE TREATMENT

Ferri-Floc coagulates water and wastes over wide pH ranges—it provides efficient operation regardless of rapid variations of raw sewage and is effective conditioning sludge prior to vacuum filtration or drying on sand beds.

LIQUID
SULFUR DIOXIDE
HIGHEST
QUALITY
SO₂

SULFUR DIOXIDE is effectively used for dechlorination in water treatment and to remove objectionable odors remaining after purification.

FREE BOOKLET

Let us send you without charge, a 38 page booklet that deals specifically with all phases of coagulation—just send us a postal card.



COPPER SULFATE will control about 90% of the microorganisms normally encountered in water treatment more economically than any other chemical.

TENNESSEE CORPORATION

617-629 Grant Building, Atlanta, Ga.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Works, Baldwin-Lima-Hamilton Corp., Aurora, Ill., by checking the reply card.

A Gasoline Engine For Many Municipal Jobs

161. Catalog on a power packed 2-cycle gasoline engine that is designed to do many municipal jobs is available from Mall Tool Co., 7752 South Chicago Ave., Chicago 19, Ill. Information on how this lightweight maneuverable engine can power a dozen attachments is included. Check the reply card.

Versatile Maintainer Has Year 'Round Usefulness

195. The Huber-Warco all purpose maintainer will work for you the year 'round on plowing snow, general sweeping and cleanup work, scalping berms and shoulders under guard railroads, as a patch roller, berm leveler and highway mower. For full details on this piece of equipment write Huber-Warco Company, Marion, Ohio, or check the handy reply card.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Comprehensive Data on Bulldozers

232. Hydraulic bulldozer and bulldozer blades for International crawler tractors are described in a 24-page catalog published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. All features are fully described, complete specifications are included and many illustrations show on-the-job operations. Check the reply card for your copy.

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Write Greenlee Bros. & Co., Rockford, Ill., or check the reply card.

Davis Back-Hoe and Davis Loader

312. Literature is available from Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis back-hoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

Aluminum Used for Roofing and Siding

418. An 8-page bulletin, describing the use of aluminum as roofing and siding material, has just been released by Kaiser Aluminum & Chemical Sales Corp., 1924 Broadway, Oakland 12, California. Aluminum can be used in water and sewage plants and industrial buildings. Complete information on its strength, appearance, corrosion resistance and lightness is included. Check the reply card today.

Get Data on Automatic Engine Control Equipment

462. Automatic controls for engine starting and overspeed protection are described in the latest Synchro-Start literature. For full application data and specifications get Catalog No. 5 from Synchro-Start Products Inc., 8151 N. Ridgeway Ave., Skokie, Ill. Requests for this valuable literature must be made on business letterhead.

Choosing Your Equipment and Maintaining Its Efficiency

534. Bulldozers, tractors, scrapers and motor graders are fully described in a catalog from Allis-Chalmers Mfg. Co., Box 512, Milwaukee 1, Wis. Covered are choosing your equipment, maintaining its efficiency and handling your jobs. Check the reply card.



THIS OPEN DOOR
GUARDS
YOUR MOST
VITAL SERVICE

Water is your community's life blood. Water meters are universally accepted as the fairest way to charge for water . . . and the only way to keep people from wasting water.

But water meters, being fine instruments, naturally lose accuracy after years of wear. They start to give away revenue. They permit leaks and carelessness to creep back, and pumping costs go up. Eventually the water system cannot cope with the growing demand.

Worse yet, lack of proper income makes people hesitant to act, and water shortages may soon become critical.

How guard against this? Pick meters that stay accurate longer. Set up a good testing and repair program.

Walk into your meter repair shop. Talk to the men whose efforts guard your water supply. Ask them which meter gives highest sustained revenue . . . with lowest repair and depreciation costs. We sincerely believe the answer will be "Trident."

NEPTUNE METER COMPANY

19 West 50th Street • New York 20, N. Y.

NEPTUNE METERS, LTD.

1430 Lakeshore Road • Toronto 14, Ontario

Branch Offices in Principal
 American and Canadian Cities.



To order these helpful booklets check the reply card inside front cover.

The Crawler Tractor, Backbone of Construction

504. A new 12-page catalog published by American Tractor Corp., Churubusco (P. Wayne), Ind., graphically illustrates how and where the 30 to 60 hp TerraTrac tractors fit in the construction picture. Illustrations of the complete tractor line, plus a complete selection of matching loaders, dozers, back-hoes, scarifiers and winches are included. Check the reply card.

Steel Cabs Designed to Fit Most Any Tractor

582. Cabs that assure operator comfort winter or summer, will fit most popular makes of front end loaders, back-hoes or combinations. The cab consists of heavy gauge steel top and supports with heavy duty canvas side and rear curtains, safety glass windshield and side windows of vinyl plastic. For details and prices check the reply card or write Northeast Equipment, Inc., 9 Brookfield St., Worcester, Mass.

STREETS AND HIGHWAYS

The Dilemma of Our Present Highway System

314. "Where Do We Go From Here?" is the title of a 16-page booklet produced by Caterpillar Tractor Company, Peoria, Illinois. Many highway problems are discussed in the interesting and informative booklet. Inadequate and obsolete highways, financing of free roads and toll roads, and whether to construct free roads or toll roads are a few of the topics. A section is devoted entirely to the story of modern highways from the planning stages through the construction stages to the finished roadways. Check the reply card for this booklet. Form 31398.

How to Select Prestressed Concrete Bridge Members

26. Colorful folder, well illustrated, shows manufacture of "Amdek" prestressed bridge members and provides selection tables covering several AASHTO loadings. Full data from Concrete Products Div., American Marietta Co., 104 East Ontario St., Chicago 11, Ill. Check the reply card for your copy of this helpful reference bulletin.

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the reply card.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy reply card for full data. Ernest Holmes Co., Chattanooga, Tenn.

Choosing Trucks For Municipal Service

204. Trucks that are high in efficiency and economy are needed for all municipal services. Be sure to investigate latest models of White motor trucks, engineered for high performance under all conditions. Full details from White Motor Co., Cleveland 1, Ohio.

Information on Trucks for Every Job

442. Literature on the complete IHC truck line is available from International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Included is information on basic models, conventional and COE, 4-wheel, 6-wheel and four-wheel-drive. Check the reply card.

Safe-T-Cones Solve Traffic Problems Night and Day

136. For data on Safe-T-Cones, the all-rubber traffic guides available in two sizes, 18" and 28"—painted or reflectorized for day and nighttime use—get bulletin from Radiator Specialty Co., Charlotte, N. C. Information included on Safe-T-Signs which add greatly to value of markers. Check the reply card.

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the reply card today.

The Modern Approach to the Brush Problem

222. Eliminate your brush disposal problem by using an Asplundh Chipper. For complete information on what the Chipper can do, how it can save on costs, various types available and other outstanding features write to Asplundh Chipper Co., 505 York Road, Jenkintown, Pa., or check the reply card.

New Reflectorized Sign Faces Refurbish Old Traffic Signs

292. Get complete details on new "EZ-On" traffic sign faces ready for immediate shipments. Reflectorized faces cost only a fraction as much as new signs and are easily attached to existing traffic signs. Grace Sign & Mfg. Co., St. Louis 18, Mo.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads, handling garbage disposal, and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tournau-Westinghouse Co., Peoria, Ill., or use reply card.



How to raise
sunken curbs
gutters
driveways
sidewalks
street slabs

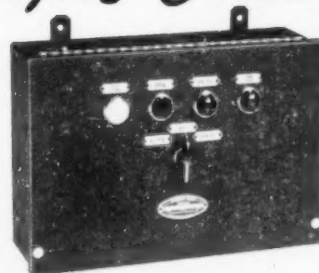
KOEHRING MUD-JACK® pumps soil-cement slurry under pressure into small holes drilled through pavement. This displaces air pockets, water, or water-saturated materials — raises the concrete slab — leaves solid, permanent sub-grade. How else could you do it? Only with a Koehring Mud-Jack. Two sizes: compact, portable No. 10 for city work (illustrated) — and big No. 50 for preventive maintenance and low-cost repairs on highways.

Write to: **KOEHRING CO., Milwaukee 16, Wis.** for Mud-Jack Bulletin.
NAME _____
STREET _____
CITY, STATE _____

K552 PW

FULL AUTOMATIC Engine Controls

Model
1436M4



SYNCHRO-START Engine Controls provide automatic start and stop from any type of remote pilot switch. Interrupted cranking periods with total time limit of cranking is a regular feature.

Standard Controls are available which provide **FULL PROTECTION** for the engine. The model shown will light an individual signal and operate an external alarm in event the engine fails to start. Should low oil pressure, high water temperature, and overspeeding occur while running, the engine will stop and Visual Signal will indicate source of trouble.

Additional safety features can be incorporated on special order.

These controls can be used with Diesel, Gasoline, and Gas engines.

Request Bulletin 501

Synchro-Start Products Inc.

8151 N. RIDGEWAY AVE. • SKOKIE, ILL.

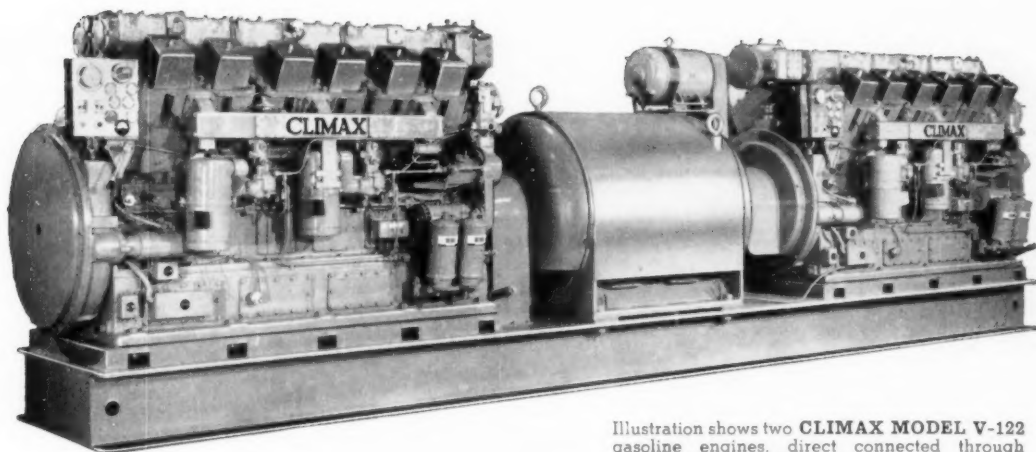


Illustration shows two **CLIMAX MODEL V-122** gasoline engines, direct connected through Automatic Clutch Type Couplings, to a single 625 KVA, 500KW, 1200 RPM, 3 phase, 60 cycle, 2400 volt AC Generator. This unit is installed in the **WASHINGTON TERRACE PUMPING STATION, ST. PETERSBURG, FLORIDA.**

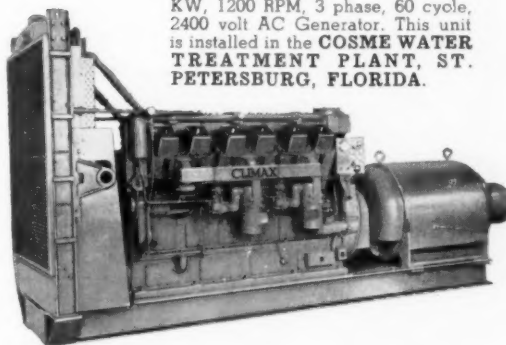
STANDBY PROTECTION WHEN YOUR POWER FAILS

In connection with the modernization and expansion of its Water Works System, the **CITY OF ST. PETERSBURG, FLORIDA** recently installed two Climax engine driven generator sets for use on a standby basis. The **TWO UNITS ILLUSTRATED** are used when normal sources of power are interrupted by tropical storms or mechanical failures.

Each of these generator sets is designed for instantaneous starting, and both are capable of supplying necessary power to operate the motor driven pumps.

Design and construction engineered by Greeley and Hansen, Chicago, Illinois.

Illustration shows one **CLIMAX MODEL V-122** gasoline engine, direct connected to a 312KVA, 250 KW, 1200 RPM, 3 phase, 60 cycle, 2400 volt AC Generator. This unit is installed in the **COSME WATER TREATMENT PLANT, ST. PETERSBURG, FLORIDA.**



ENGINE AND PUMP MFG. CO.

208 So. La Salle St.
CHICAGO 4, ILLINOIS
Factory—Clinton, Ia. District Office—Dallas, Tex.

To order these helpful booklets check the reply card inside front cover.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the reply card for your copy.

Use of Patch Material On All Maintenance Jobs

297. With the Barber-Greene Mixall you can get hot patch material wherever and whenever you need it for all maintenance jobs. Send for new 8-page bulletin that gives full information on this small, highly portable unit that turns out all types of bituminous patch material in any quantity you need. Write Barber-Greene Co., Aurora, Ill., or use the reply card.

Better Drainage for Streets and Highways

358. Irving "Dryway" Drainages provide maximum drainage openings for catch basins inlets, across-the-road drains and center-line drains. Light weight, strength, economy and corrosion resistance are a few of the many features offered. Full descriptive details on both riveted and pressure locked type are furnished in an illustrated bulletin by Irving Subway Grating Co., Inc., 50-53 27th St., Long Island City 1, N. Y. Check the reply card.

Literature on 1957 Chevrolet Utility and Maintenance Trucks

579. Light and medium duty 1957 Chevrolet trucks are described fully in literature available from Chevrolet Div. of General Motors, Detroit 2, Mich. New features include modern versions of Thriftmaster and Jobmaster 6's and the short-stroke Trademaster V8's and the 283 cu. in. Taskmaster V8's. Also optional features are the Hydra-Matic and Powermatic transmissions. Check the reply card.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrate various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the reply card or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Soil-Cement

Laboratory Handbook

405. An 86-page handbook for laboratory and testing engineers is published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill. It describes soil identification, details of laboratory soil and soil-cement testing and interpretation of test data. The handbook includes charts and tables to simplify laboratory work and describes the latest methods, now in use by the PCA laboratory, which have greatly reduced testing time. Check the reply card.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Pavement

Markers and Strippers

538. Self-propelled and truck mounted paint striping equipment for city, county and state highway departments are fully covered in bulletins from Kelly-Creswell Co., Xenia, Ohio. Specifications and methods of operation are included. Check the reply card.

New Type Rubber Joint For Concrete Sewer Pipe

566. Rexon "K" gaskets is a new type rubber joint for coupling 4" to 24" diameter bell and spigot concrete sewer pipe. The 4-page bulletin released by Hamilton Kent Mfg. Co., 427 West Grant St., Kent, Ohio, contains engineering data and diagrams, method of application and photographs. Check the reply card.

Four-Wheel-Drive

Tractor Shovels

572. Literature is available on the Model HU and Model HH Payloader tractor shovels. Features, specifications, capacities and performances are fully covered. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill.

Paving Manual on

Asphalt Hot-Mix Design

Authoritative instructions on mix design methods for hot-mix asphalt paving are furnished in a new 168-page pocket-size manual published by The Asphalt Institute. The Marshall, Hveem, Hubbard-Field and Smith Triaxial methods are outlined in detail; test procedure and interpretation of data are provided for each method; and information is given on gradation analysis of aggregates and on density and voids analysis of compacted paving mixtures. The price of this Manual is \$1.00. To order, write direct to The Asphalt Institute, College Park, Md.

STREET LIGHTING AND TRAFFIC CONTROL

Valuable Booklet on Series Streetlighting Systems

306. This booklet discusses the operating characteristics of mercury lamps on series street lighting systems and analyzer requirements for auxiliary equipment. Wiring diagrams and photographs to illustrate the principal equipment required for series operation are furnished. Booklet B-6513 is available from Westinghouse Electric Corporation Lighting Division, Edgewater Park, Cleveland, Ohio, or by checking the reply card.

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concrete
digesters...

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- Architecturally Pleasing
- Big Jobs . . . Small Jobs

If you are planning for Sludge Digestion Tanks, be sure to check on Prestressed Concrete Digesters. Today's most modern installations take advantage of many economies offered by Prestressed Concrete design.

Send for Bulletin T-7 on SLUDGE DIGESTION TANKS
INTERESTED IN WATER TANKS? Send for Bulletin T-12

THE PRELOAD COMPANY, INC.

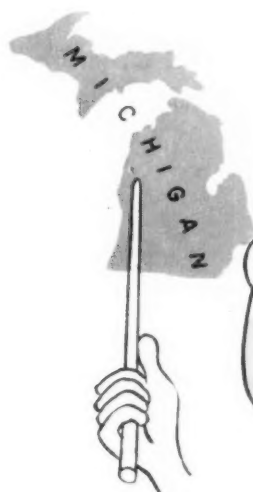
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**How many communities
in Michigan are served
by Nichols Herreshoff
furnaces?**

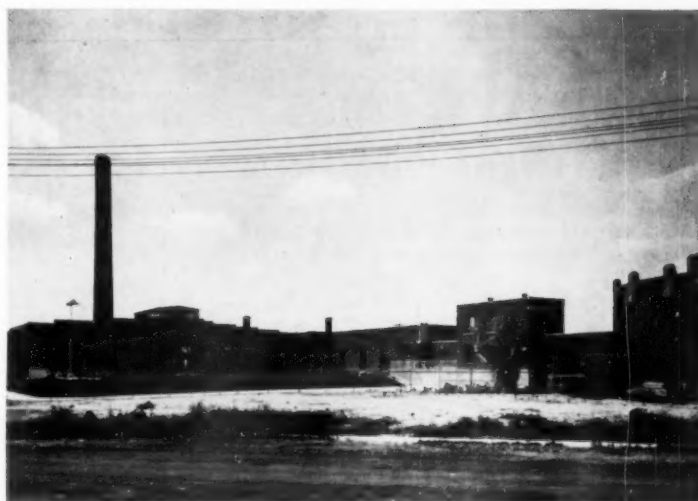
**... MORE THAN
50**



The sewage solids of more than 50 Michigan communities are burned or dried in Herreshoff furnaces. This represents an actual contributory population of nearly three and a half million people. Industrial wastes add another large population equivalent to this total.

Nichols Herreshoffs have been proved the simplest, cleanest and most economical of all dryer-incinerators.

Ohio, too, is well served by these furnaces. Combined total capacity of plants built, building or under contract is 2000 tons of sludge per day.



Wyandotte Sewage Treatment Plant
Engineers: Hubbell, Roth & Clark, Inc., Detroit, Mich.

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Multiple Hearth Dryer-Incinerators

Nichols Engineering & Research Corp.

70 PINE ST., NEW YORK 5, N. Y.

1637 N. Illinois St., Indianapolis 2, Ind.

1477 Sherbrooke St. W., Montreal 25, Canada

To order these helpful booklets check the reply card inside front cover.

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy reply card. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Engineering Data on Aluminum Lighting Standards

256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, traffic signal posts and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St., Newark, N. J.

General Electric Floodlight Bulletin

480. A two-color bulletin on general purpose sports and outdoor area flood-lighting is available from the General Electric Co., Schenectady, N. Y. The publication, designated GEA-6435, describes in detail the efficiency, low maintenance costs, and optimum beam candle-power distribution of the unit.

REFUSE COLLECTION AND DISPOSAL

New M-B Packer Body Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16, 22, 24 cu. yd. capacities. Get all the facts from M-B Corp., New Holstein, Wis.

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

Developments in Refuse Collection

119. The "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 7, Tenn. Check the reply card today.

Use The Reply Card

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the reply card.

SNOW AND ICE CONTROL

Calcium Chloride for Various Municipal Uses

157. A booklet on calcium chloride discussing its use in dust and ice control, dehumidification, refrigeration brine, concrete curing, dust-proofing coal and surface consolidation is available from Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pa. Photographs and tables are included. Check the handy reply card.

End Dangerous Ice Hazards

294. Many progressive municipalities use rock salt as standard practice for prevention of ice hazards on streets and highways. Get full data on Sterling "Auger-Action" Rock Salt and suggestions on storage methods from International Salt Co., Scranton, Pa. Check the reply card today.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, Thousand Islands, New York, or check the reply card for the catalogues.

How to Make Icy Surfaces Safe

455. A bulletin on how calcium chloride works in ice control and directions for its use has been made available by Wyandotte Chemicals Corp., Wyandotte, Michigan. Other uses of calcium chloride are fully outlined. Check the reply card.

LIQUID LEVEL and INDUSTRIAL CONTROLS

Positive! Dependable! Economical! No floats! No moving parts in liquid. Unaffected by acids, caustics, pressures or temperatures.

Induction relays, magnetic contactors and starters. Special control panels.



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FILTER SAND AND GRAVEL

Produced from an inland pit hence free from river contamination and foreign matter.

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2,000,000-gal. Horton Elevated Tank

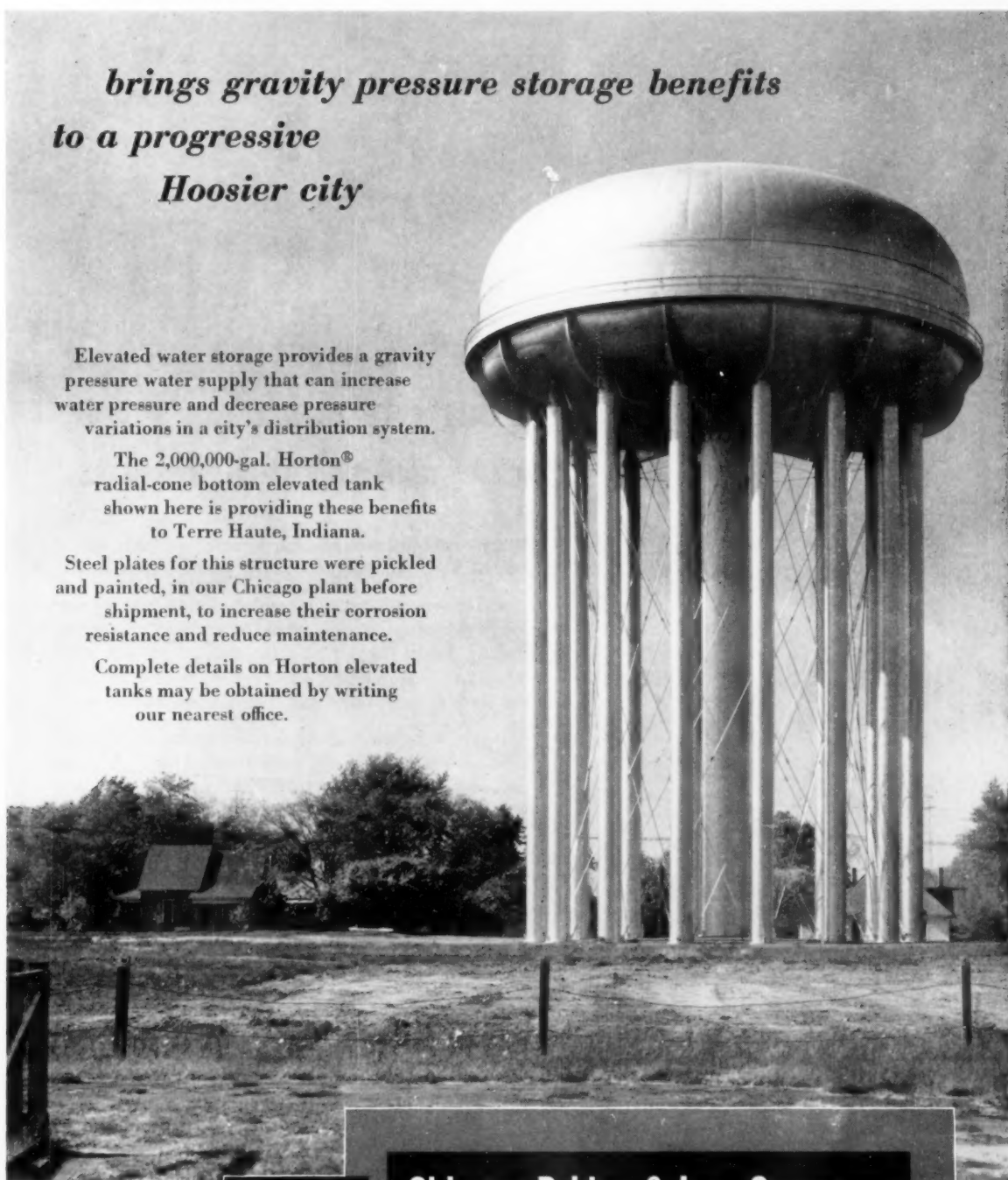
*brings gravity pressure storage benefits
to a progressive
Hoosier city*

Elevated water storage provides a gravity pressure water supply that can increase water pressure and decrease pressure variations in a city's distribution system.

The 2,000,000-gal. Horton® radial-cone bottom elevated tank shown here is providing these benefits to Terre Haute, Indiana.

Steel plates for this structure were pickled and painted, in our Chicago plant before shipment, to increase their corrosion resistance and reduce maintenance.

Complete details on Horton elevated tanks may be obtained by writing our nearest office.



2,000,000-gal. Horton radial-cone bottom elevated tank erected at Terre Haute, Ind.



Chicago Bridge & Iron Company

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Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

new industry wants to know —



interested in your city.
ing it seriously. Before we can reach a final
decision, however, we must be sure your city
can supply our huge water requirements.
Other considerations being equal, we must

**"we must be sure
your city can supply our
huge water requirements."**

When an industry seeks a new plant location, this is one of the first questions asked of a community.

Executives of industry want to know that a community's water supply is ample for product processing, cooling, boiler feed, sanitation and service purposes. They want assurance of an adequate reserve capacity for peak requirements and future plant expansion.

If prospects are bright for your community's industrial development in the period ahead, don't let lack of water stymie its progress. Plan now to supply the water industry wants.

Equally important as adequate water is its dependable delivery. That's why —

Permanent and Trouble-Free

CAST IRON PIPE

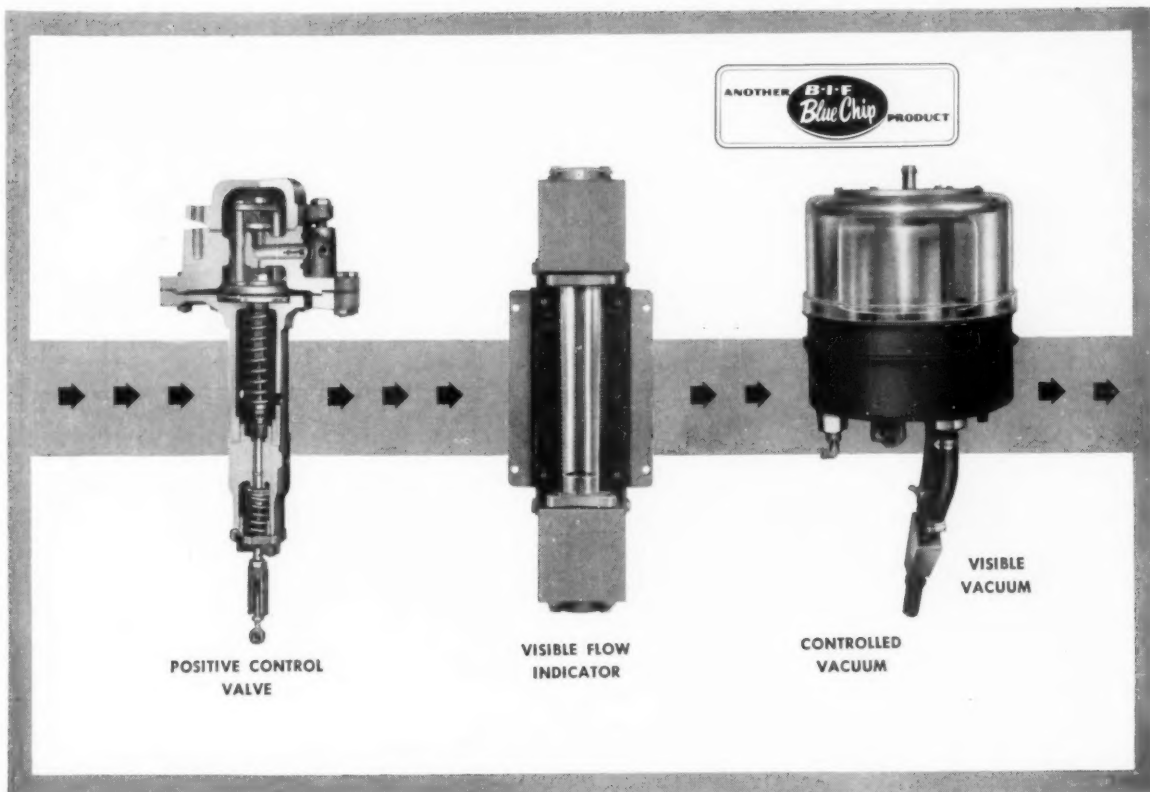
Should Be Specified

Because of its century or more of useful life, its high capacity as a carrier and negligible maintenance cost, Cast Iron Pipe has earned its reputation as

"America's No. 1 Tax Saver."

Our Company does not manufacture pipe but has long supplied the nation's leading cast iron pipe manufacturers with quality iron from which pipe is made.

WOODWARD IRON COMPANY
WOODWARD, ALABAMA



IN CHLORINE GAS FEEDERS . . .

LOOK FOR

KNOW-HOW

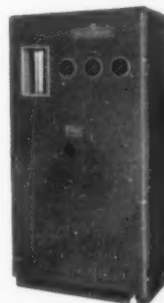
Here's proof of good chlorine feeder design! The gas flow path shown in this Builders-Providence flow-gram is the shortest offered by any manufacturer of chlorination equipment . . . and we invite comparison! Good design means maximum dependability (to the consulting engineer) . . . ease of installation (to the contractor) . . . and easy operation, low upkeep, and low operating cost (to the operator).

Our design offers all these and more. For added safety . . . there are no springs or piloted parts in contact with chlorine, no packed valve stems to leak and destroy feeding accuracy . . . and the simplicity of the entire system means better operation with less maintenance.

These superior features did not just happen — but are drawn from the vast reservoir of B-I-F application knowledge and experience gained as the major manufacturer of flow metering and control equipment for WATER, SEWAGE, and WASTE TREATMENT PLANTS. Many consulting engineers

have profited by the valuable assistance received from B-I-F specialists. Our policy of continuing research and development has produced the most comprehensive, service-proven line available . . . and thousands of superior performance records reflect our broad design and manufacturing experience.

If you have a chlorine gas feeding problem, our engineers will gladly help you solve it. A call to GASpee 1-4302 in Providence . . . or to one of our local offices . . . will put us at your service. B-I-F Sales and Service Offices are located across the country for your convenience. Act today! Builders-Providence, Inc., 356 Harris Avenue, Providence 1, R. I.



B-I-F INDUSTRIES

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METERS
FEEDERS
CONTROLS

BUILDERS IRON FOUNDRY • PROPORTIONEERS, INC. • OMEGA MACHINE CO. • BUILDERS-PROVIDENCE, INC.

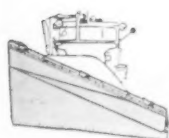
PUBLIC WORKS for December, 1956

51

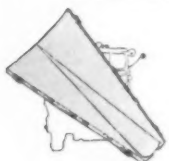
There is only one Roll-Over
...and it's made by FRINK



For Airports and Dual Highways



The Frink Taper Blade Roll-Over Sno-Plow combines the advantages of the reversible blade type with higher speed, deeper snow handling qualities of the one-way plow.



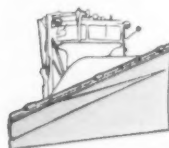
This plow throws and spreads the snow, yet can be hydraulically rotated from left hand to right hand plowing position in 15 seconds, enabling the operator to throw *all* the snow in the most favorable direction as dictated by the wind or the location of the disposal area.



Deadheading is eliminated, therefore, less equipment is needed. Parking is easier, because the truck can be parked with the Roll-Over in the upright position within its own width.



The Frink V-Type, One-Way Type, and Reversible Type Sno-Plows can all be attached to the Roll-Over Lifting Device Assembly.



FRINK
SNO-PLOWS

Clayton, 1000 Islands, New York

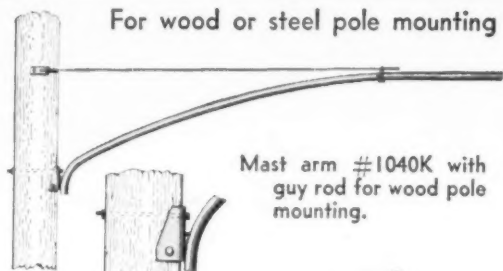
Made in Canada by

Frink Sno-Plows of Canada, Ltd., Toronto, Ontario

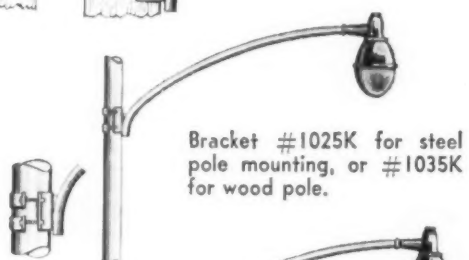
KERRIGAN *Weldforged*

Steel Brackets & Mast Arms

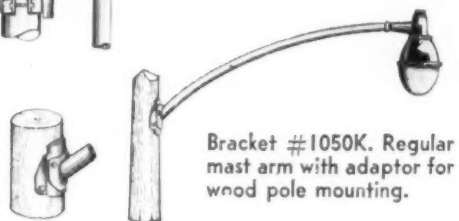
For Economy & Beauty



Mast arm #1040K with
guy rod for wood pole
mounting.



Bracket #1025K for steel
pole mounting, or #1035K
for wood pole.



Bracket #1050K. Regular
mast arm with adaptor for
wood pole mounting.

Kerrigan's complete line of brackets and mast arms are carefully engineered for easy installation and wiring. They meet all I.E.S. street lighting recommendations. So, take advantage of your wood poles now in place and brighten up your city or town NOW!

Let us help you

solve your city's lighting
problems. Send for our
FREE catalog containing
engineering data. It shows
how simple installation
really is.

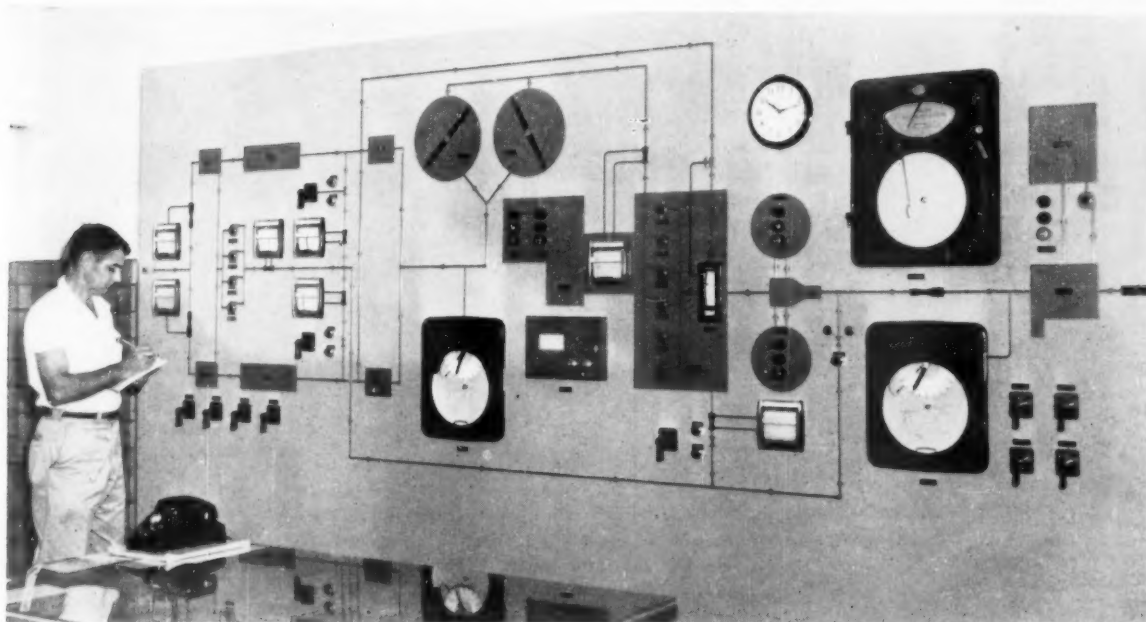
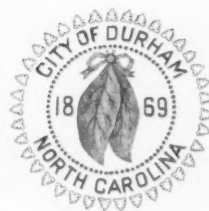


KERRIGAN IRON WORKS, INC.

Nashville, Tennessee

Gen'l. Sales Office — 274 Madison Ave. — N.Y.C.

NEW MUNICIPAL SEWAGE PLANT HANDLES HIGH B.O.D. EFFICIENTLY



... with Foxboro Centralized Control

Strong textile wastes mixed with domestic sewage create a difficult treatment problem for the Northside Waste Treatment Plant of the city of Durham, N. C. Raw waste, averaging as much as 600 p.p.m. B.O.D., must be made safe for discharge into a small stream. To do the job with highest efficiency and economy, the plant utilizes a dual treatment process under Foxboro Centralized Control . . . produces an effluent B.O.D. of from 12 to 30 p.p.m. And a Foxboro Graphic Control Panel keeps the entire operation before the eyes of a single operator!

In addition to providing the highly accurate and efficient centralized control that this modern plant requires, plant officials cite the additional help the Foxboro Graphic Panel affords in training personnel and explaining operations to visitors. It's a typical example of the many waste treatment problems successfully solved by Foxboro Instrumentation. Get similar efficiency and economy in your operation. Write The Foxboro Company, 2612 Norfolk St., Foxboro, Mass.

High B.O.D. of influent necessitates dual treatment at the Northside Waste Treatment Plant, Durham, N. C. — first with recirculating high-rate trickling filters, then with activated sludge. The Foxboro Graphic Panel (above) keeps all vital operating data constantly before one operator. Foxboro Instruments on panel measure: pH of influent and of trickling filter effluent; flow to filters; plant effluent flow; and return and waste sludge flow. Consulting Engineers: Piatt and Davis, Durham, N. C.

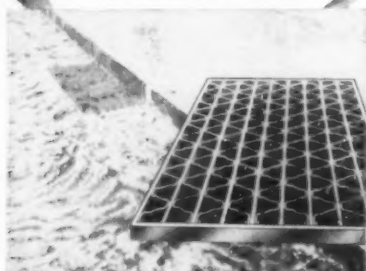


FOXBORO

REG. U. S. PAT. OFF.

**INSTRUMENTATION for
WASTE TREATMENT**

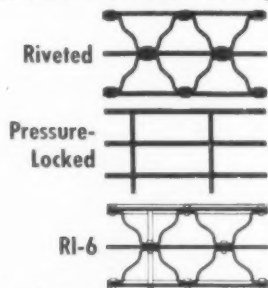
FLOODED HIGHWAYS HINDER TRAFFIC



OLD heavy cast iron drain-grates, averaging at best 40% clear opening, often fail to carry off rain water fast enough during heavy downpours, resulting in flooded highways—particularly at underpasses. Also, cracked draingrates must be replaced.

With open steel mesh drain-grates, larger clear openings reduce the likelihood of flooded highways considerably. Irving "Dryway" Draingrates are 75% open for greater drainage and are made of steel bars on edge, not subject to cracking.

Available in three basic designs:

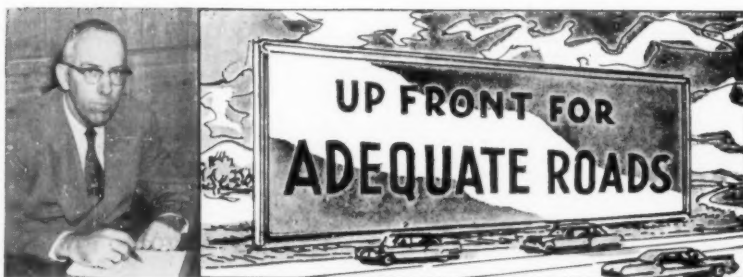


Write for brochure on "Dryway" Draingrates
Self-maintaining, Lightweight, Economical, Safe

IRVICO

IRVING SUBWAY GRATING CO., Inc.
Originators of the Grating Industry

Offices and Plants at
50'3 27th St., LONG ISLAND CITY 1, N. Y.
1803 10th St., OAKLAND 23, CALIFORNIA



by LEO J. RITTER, JR.

Highway Consultant

The Best of Everything to You—Before we forget, our sincere wishes to all of you for the merriest Christmas ever and the best of everything for 1957. The coming year should be a tremendous one for highways and public works construction of all kinds. May you share in it to the fullest possible extent.

City Does—The Department of Traffic of the City of New York has devised a new traffic flow wall map showing traffic volumes on the heavily traveled thoroughfares of the city—the map covers 49 square feet and has the unusual feature that the red bands denoting traffic volume (1/5 inch = 20,000 vehicles) can be made narrower or wider in a matter of minutes. Aircraft operations reached a new high in fiscal 1956, according to the CAA—the greatest number of operations at a single airport again occurred at Midway Airport in Chicago (380,000 operations). Plans for a double-loop expressway, which will by-pass the downtown area and connect Nashville with segments of the National System of Interstate Highways have been announced; completion of the expressways is expected to require from 6 to 10 years. The Ten Ten Parking Garage, located in downtown Houston, parks 1500 cars at one time on seven levels, two of them below ground level.

St. Lawrence Seaway—As all of you know, the current development

of the St. Lawrence Seaway is of tremendous consequence to transportation in this country—particularly to the cities and states on the Great Lakes, in the heart of Mid-America. In this regard, may we take off our hats to the recent "Avenue of Destiny" brochure issued by the Cummins Engine Company of Columbus, Indiana. This is industrial advertising at its best.

Concrete Overlay—Tests of a prestressed concrete overlay of an existing concrete pavement at San Antonio's International Airport have been completed by the Southwest Research Institute. Runways and taxiways at the airport have been breaking up because they were not designed to withstand modern aircraft wheel loads and heavy traffic. Experiments were conducted to compare conventional concrete overlay with the prestressed concrete. Test sections were constructed on Taxiway No. 1, which carries very heavy traffic. Tests are reportedly successful and it is claimed that the somewhat higher initial cost of the prestressed overlay is more than offset by longer service life and lower maintenance costs.

Administrative Costs—A very interesting study of the relationship between costs of maintenance and administration and the size of local governmental units concerned with rural road administration has been released recently by the University of Illinois, Department of Agricultural Economics. The report is much too long to be abstracted in full here, but the following tabulation is of interest.

Number of miles of road administered	Administrative cost per mile	Maintenance Cost per mile	Total maintenance & administrative cost per mile
10	\$87	\$316	\$403
20	56	247	303
30	45	224	269
40	41	212	253
50	38	205	243
60	35	201	236
70	34	197	231

"Old Faithful" — This Le Roi engine provided 17 years of dependable service without a forced shutdown for the City of Battle Creek, Michigan. Shown below is the modern H540/V-8, with John Larson. Mr. Larson has had 30 years' experience operating stationary engines, and really knows a good engine when he sees one.



122,105.6 hours logged with only four overhauls ...dependable performance like this proves the value of Le Roi engines

In 1937, the City of Battle Creek installed its first Le Roi engine. Seventeen years later, when it was time to modernize, this engine had piled up the amazing total of hours shown above.

This is just one more example of Le Roi dependability. It is also proof of the excellent maintenance work performed by John Larson and his staff.

In 1954, "Old Faithful" was replaced by Le Roi's H540, a modern short-stroke V-8. The H540 normally operates at 1500 rpm, but, because of its short stroke V-8 design, piston speed is no greater than that of longer stroke, slower speed engines.

Moreover, the H540 provides new flexibility. This flexibility really paid off during flood conditions when

the electric pumps were shorted out. The H540 ran up to 2100 rpm and, by so doing, carried the entire plant load for several days.

Performance during this emergency clearly indicated the advantages of the H540's short-stroke V-8 design. It proved that you get more horsepower per dollar and more horsepower per space. Other plus factors are easier servicing and easier installation.

Whether it's for continuous or standby service, or for pumps, blowers, or generators, it pays to use Le Roi engines. Le Roi power is dependable, low-cost power — power that can help ease the tax load in your community. You can get it in sizes ranging to 645 hp., or in custom generator sets from 50 to 350 KW. Write us for detailed information.

E-103

LE ROI



Division of Westinghouse Air Brake Co.

Milwaukee 1, Wisconsin



PORTABLE AIR COMPRESSORS



TRACTOR



STATIONARY AIR COMPRESSORS



AIR TOOLS

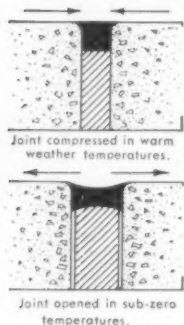


ENGINES



when you specify and use SERVICISED hot-poured PARA-PLASTIC®

- ★ Keeps joints sealed under severest conditions of Traffic and Temperature
- ★ Pumped directly into joint from melting kettle



Hot poured Para-Plastic is the *original* hot poured rubberized asphalt joint sealing compound. It forms a resilient, adhesive and effective plastic which maintains bond at sub-zero temperatures. Superior characteristics of adhesion and cohesion, together with its stability under extremes of temperature make hot poured Para-Plastic the most effective, joint sealing material available.

JET FUEL RESISTANT TYPE

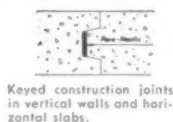
Servicised hot poured Para-Plastic JF is a specially compounded material with all the stability, plasticity and sealing characteristics of regular Para-Plastic,

and in addition is unaffected by jet fuel and solvents. It is used for sealing pavement joints on airport runways, taxi strips and aircraft parking aprons.

PARA-PLASTIC SEALING STRIPS

molded Para-Plastic

For sealing keyed construction or contraction joints in vertical walls. Maintains bond with concrete at temperatures to sub-zero. Simple installation insures a moisture-tight seal of the joint.



Keyed construction joints in vertical walls and horizontal slabs.



Molded Para-Plastic sealing at a footing.

Para-Lateral Strip

Get complete information on Servicised Para-Plastic sealing compounds. Write for the Servicised Catalog.



Designed for sealing against seepage in vertical construction and contraction joints in foundation walls, retaining walls, tunnels, abutments, wing walls where back filling against one side of the structure is required.

SERVICISED PRODUCTS

CORPORATION

6051 WEST 65TH STREET • CHICAGO 38, ILLINOIS



The study was based upon rural roads in Illinois and has some limitations. Nonetheless, the study confirms the basic concept that we have given in these columns before. That is, the smaller the unit, the less efficient it is for the administration of road affairs. This inefficiency is most marked in the smaller units (like townships), such as those involved in the Illinois study.

It is a basic rule that, for efficient administration, the extremely small units should be relieved of responsibility for road maintenance. The county, not the smaller unit, is fundamentally the most efficient local governmental unit for road administration.

Shoulder Stabilization—An interesting method of stabilizing road shoulders is being utilized by the Oregon State Highway Department. The method basically consists of stabilizing the existing shoulder material with emulsified asphalt. The emulsified asphalt used is a mixing grade, SS-1.

The construction procedure varied somewhat, but the first step usually was to sprinkle the shoulder with water to help hold the fines in place. Then the shoulder material was bladed away from the pavement to a depth of about one inch. The emulsified asphalt then was added in several shots, with a total application of from 0.65 to 0.80 gallon per square yard. Some blading was done to aid in dispersing the emulsion.

A blade grader was used to finish grade the shoulder, after which the area was rolled with a steel wheel roller. After rolling, a light application of emulsion was made and the surface covered with coarse sand. After a curing period of a week to ten days, a seal was applied, consisting of 0.25 gallon per square yard of quick-breaking emulsion (RS-2) covered with 1/4-in. to No. 10 stone chips. The final step was to drag broom the seal coat.

Average cost per mile for stabilization of two 8-foot shoulders by this method was reported to be about \$2,000. This compared with a similar cost of about \$3500 per mile for conventional oil mat construction.

Soil-Cement—The Portland Cement Association has three very good technical booklets dealing with soil-cement design and construction.

These are the *Soil Primer*, *Soil-Cement Construction Handbook*, and *Soil-Cement Laboratory Handbook*. All three of these booklets have been completely revised, with 1956 editions now available on request.

the **P&K** story



HIGHWAYS



DRIVE-INS

BETTER LIGHTING everywhere



SHOPPING CENTERS



PARKING AREAS



RECREATION AREAS

AT LOWER COST to everybody

Pfaff & Kendall, originator of the Seamless Tapered Aluminum Lighting Standard and Tapered Elliptical Arm, is now producing designs and types to meet any highway, road, area, bridge and traffic signal requirement.

Wherever P & K All-Aluminum Standards and Brackets are specified and installed, the story is the same: *Fewer technical problems . . . rapid, easy installation . . . greater lighting efficiency . . . and the kind of economy you can figure in actual dollars!*

P & K All-Aluminum Standards and Brackets are always the wisest choice . . .

LIGHT WEIGHT for lowest cost installation.
NEGLIGIBLE CORROSION for longest service.
NO PAINTING means large, year-after-year savings.
SALVAGEABLE, RE-USABLE in event of knockdown.



WRITE FOR LATEST
P & K CATALOG...
and use the P & K
planning and advisory
services without obligation.

P **faff & K** **endall**
84 Foundry Street
Newark 5, New Jersey

- "...our **CLEVELANDS** dig them all... in all types of soil and terrain... swamps, sand, rock, shale, clay... stumps, boulders and other obstructions... hill and flat land..." says Hubert S. Eley, vice president of the D. A. Foster Trenching Corp., Merrifield, Va. Starting with a rented Cleveland in 1949, the firm now owns 10 (Models 95, 110 and 140) and keeps them constantly busy.
- "...in 15 or 20 minutes we complete a gas or water house connection with one of our **CLEVELANDS**."
- "...1800 to 2000 feet of 30" deep trench per day... our average production on building footings with a Cleveland."



- "...not necessary to stockpile large amounts of parts for **CLEVELANDS**."
- "...**CLEVELANDS** operate a working week on a tank of fuel."
- "...all-around adaptability... just one of the many reasons why we prefer **CLEVELANDS**... besides utilities work and footings, we use them for drainage trenching, septic tank installations and a wide range of other applications."
- "...our **CLEVELAND 140** paid for itself within 30 days."
- "...best all-purpose trenchers made... the easiest to operate... and the longest lasting."

*Cleveland users everywhere report similar satisfactory experience... it's typical of the performance you can depend upon with **CLEVELANDS**.*

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Everywhere

from your district office of PCA or from the headquarters office, 33 West Grand Avenue, Chicago 10, Illinois. The *Soil Primer*, particularly, has had very wide acceptance and circulation over the country. Major topics covered in the *Soil Primer* are Soil and Soil Properties, Soil Identification and Classification, Soil Surveys and Soil Sampling, Soil Bearing Value Tests, and Examples of Soil Surveys, Tests and Analyses. Soil classification systems covered are the USDA, AASHTO (Highway Research Board), Unified (used by the Corps of Engineers and Bureau of Reclamation), and CAA systems. The examples of soil surveys, tests, and analyses are of particular interest and value to those new in the field. There are many excellent publications covering all phases and kinds of concrete construction available from PCA. Don't forget to ask for their information—you'll get a whole hatful free on request and they will be worthwhile.

Steel Plank Bridge Flooring—A recent issue of the Highway Engineering Report (No. 7-56) by Armco Drainage and Metal Products, Inc., Middletown, Ohio, describes typical installations of Armco Bridge Plank to replace worn out timber or concrete bridge floors. Floors on otherwise structurally sound bridges are easily and quickly renewed by welding steel floor panels into place.

'Round and About—Work is under way on 5½ miles of secondary roads in Oconee County, South Carolina—projects include grading and bituminous surfacing. The longest continuous county federal-aid secondary route in California has recently been completed and surfaced—the road extends from the Susanville to the northern county line, in Lassen County, and is 67 miles in length. The Division of Highways of the State of California has produced or scheduled the production of five color filmstrips, for use in training departmental personnel—the strips cover (1) concrete pavement construction, (2) asphalt plant operations, (3) plant-mix surfacing operations, (4) earthwork operations, and (5) drainage structures. The entire October issue of the Highway Magazine (published by Armco Drainage and Metal Products, Inc., Middletown, Ohio) was devoted to toll roads—some very fine color pictures are included. CAA personnel are mourning the recent and untimely death of Charles J. Bowen, Administrator—he was 41 years old.

★ THE SELF-LOADER WITH ELBOW ACTION

HOLMES
OWEN LOADER

DRIVER LOADS,
HAULS and DUMPS

SOLVES Many JOB Problems

VERSATILE ONE-MAN OPERATION SAVES Time - Manpower - Equipment

The new Holmes-Owen Loader offers a very practical solution to many of the problems which state, county and city officials are now facing in providing increased community services.

The new self-loader provides the answer to such problems, for this equipment converts the usual dump truck into an independent working unit capable of performing a wide variety of work. It saves time, labor and the use of more costly equipment by permitting the truck driver to do his own light digging, grading, loading, and cleaning-up.

A dump truck with such versatile one-man operation can easily do the work of several men, thereby drastically cutting the cost of many jobs, such as: the handling of various stock pile materials, removal of debris, trash, snow, etc., cleaning-up of streets, intersections, parkways, etc. Let us show you how a Holmes-Owen Loader will solve your work problem. Ask your equipment dealer for details or write factory direct.

Manufactured by

Developers of HOLMES WRECKER Equipment

ERNEST HOLMES COMPANY, Chattanooga, Tenn.



DRIVER controls digging and loading operation from cab.



One-man operation speeds up LOADING, HAULING and UNLOADING.

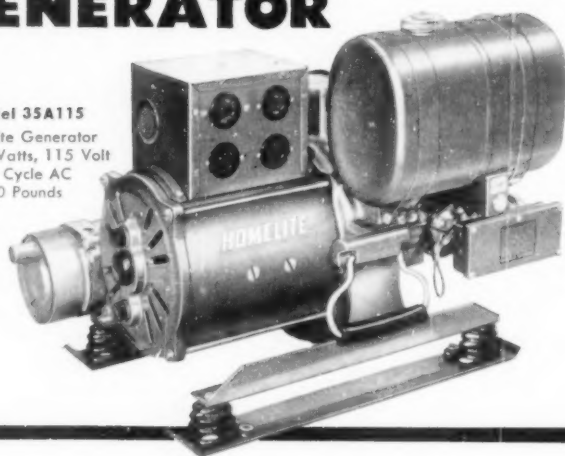


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1500 WATT HOMELITE GENERATOR

Model 35A115
Homelite Generator
1500 Watts, 115 Volt
60 Cycle AC
90 Pounds



Easy to Carry... ...Easy to Use

- 1. New Money-Saving Features...** No DC brushes; just two easy-to-get-at collector ring brushes... No commutator or DC windings... No intermediate couplings; armature keys directly to shaft. Fewer parts to wear out — longer trouble-free generator service.
- 2. Constant Voltage...** less than 4% change from no load to full 1500 watt capacity... assures long service life for your electric tools... guarantees top performance at all times.
- 3. Overload Capacity...** 1500 watt continuous duty with generous overload capacity prevents tool stalling under heavy loads... insures uninterrupted service even when starting loads exceed operating loads.
- 4. Compact and Lightweight...** one man can easily carry this generator wherever you need elec-

tricity to power time-saving electric tools. No need for long, hazardous power-consuming cables.

Whatever tools you want to operate — electric soldering irons, drills, floodlights, grinders, hammers, the new Homelite 35A115 generator can save you money. For a free demonstration or additional information, call your nearest Homelite representative.

SAVE EVEN MORE! New Homelite electronic idle control unit, available as optional accessory, runs engine at idle speed when no current is drawn... automatically brings engine to full speed when load is

applied.

Ask your Homelite representative to show you how this easily-installed accessory reduces engine wear... increases service life... cuts fuel consumption.

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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD,
Dr. Eng. Sci., LL. B.

When Highways Get Into Ruts

Buffington v. State, 152 N.Y. Supp. (2d) 716, a New York case decided May 25, 1956, involved a claim for personal injuries against the State of New York, founded on negligence in failing to maintain the highway in good repair.

The highway in question was 22 feet wide. On the day of the accident, it was dry and the day was clear and bright. An earth shoulder, varying in width from 2 to 5½ feet from the concrete to the grass paralleled each side. The shoulder was rough in spots, sandy, definitely rutted, badly marked and scarred, with stones and obstructions at intervals. The concrete surface of the road varied from 3 to 6¼ inches higher than the earth shoulders in the vicinity of the accident, and the shoulder was in a hazardous and dangerous condition. There were no warning signs or highway signs near the scene of the accident to give warning of the dangerous drop-off and defective shoulder. The condition had existed for many months before the accident.

At the time of the accident, Buffington was driving alone in his car at 30 miles per hour. As he approached the scene of the accident, a truck carrying a concrete mixer, and going in the opposite direction, nosed out of its lane, and partly into Buffington's lane. Buffington pulled over to his right to avoid hitting the truck, and the two right wheels of his car dropped into the rut and rough shoulder, causing him to lose control. He slowed down, but before he could bring his car to a stop, he struck something on the shoulder which diverted him back onto the concrete at an angle, and he hit the cement mixer, which was by now on its own side of the road. As a result, Buffington sustained considerable pain and injury, some of which is permanent.



Buffington received \$3500 from the Town of Dewitt and \$2500 from the Town of Salina, in settlement of his claims against them for not maintaining the road (which was at or close to the dividing line between the two towns), and an additional sum of \$21,807.30 from the State, making a total of \$27,807.30 (\$25,000 for personal injury, and \$2,807.30 for expenses and loss of wages).

Icy Highways

In *Bird v. State*, 152 N.Y. Supp. (2d) 65, a New York case decided May 7, 1956, the driver of an auto was injured and his wife killed on an icy highway. The driver sued the State for negligence in construction and maintenance of the highway.

The accident occurred on March 15. Road conditions were generally bad due to snow, wind, and cold. The maintenance crew had sanded the highway twice during the day.

The section of highway in question was built in 1928 according to good construction standards. The length of the curve was 498 feet and it was about a 10 degree curve. The pavement was 22 feet wide with seven foot shoulders on each side. Going north on the road there was a 5.3 percent downgrade which levelled off about 130 feet south of the curve. For the first 300 feet of the curve there was a 1.7 percent upgrade and then for the balance of the curve there was a downgrade of about 1.12 percent. The road was properly banked with the left hand side going north varying from 2.1 to 2.2 feet higher than the right hand side. The terrain west of the seven foot shoulder was either level or sloping down away from the road. To the east of the pavement, there was a seven foot shoulder and then a ditch and a bank four or five feet high. The shoulders of the road sloped one inch per foot downward away from the pavement.

Bird's car was going 30-35 miles per hour as he entered the curve. On the curve, the car left the pavement, travelled up to the top of the

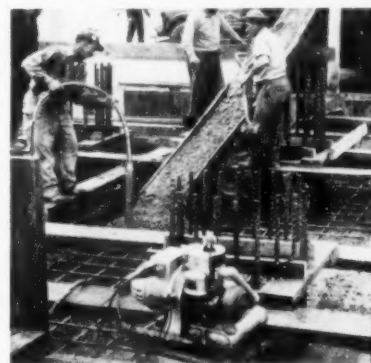
Full Line of Carryable Construction Equipment Now Offered by Homelite



Carryable Diaphragm Pump . . . This self-priming, 120 pound diaphragm pump will handle water in the thickest sand, muck, or mud. Capacity: 5,000 g.p.h. Size: 3". Complete line of centrifugal pumps are also available in sizes from 1½" to 3".



Chain Saws For Every Job . . . Now you can choose from a full line of lightweight, powerful Homelite chain saws. From 3½ to 7 horsepower . . . 19 to 29 pounds. Brush cutting and clearing attachments are available to handle all your cutting jobs.



One-Man Electric Vibrator . . . It takes only one man to place concrete with powerful, Homelite high-cycle or universal electric concrete vibrators. Carryable Homelite generator provides power for high-cycle vibrators and 110 volt DC for all universal vibrators, tools and floodlights.

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3

FASTER OPERATION

EASIER HANDLING

MORE POWER

On Your OTTAWA HEAVY-DUTY BACKHOE

1 THE AUTOMATIC EJECTOR BUCKET

on the Ottawa heavy-duty Backhoe forces all wet, sticky material from the bucket automatically—in the dumping cycle of the bucket. No extra control is needed. This speeds work during the rainy season—speeds work when material has a natural tendency to stick or wedge in the bucket . . . and it's exclusive with the Ottawa Backhoe.

2 ONLY 2 LEVERS ("One-Trols") DO FOUR OPERATIONS.

There's no fumbling! Just 2 levers on the Ottawa heavy-duty Backhoe control the dig, hoist, swing and bucket action. This speeds up the cycle time in all phases of the Backhoe operation—provides smoother, easier, quicker handling by either skilled or unskilled operators . . . and it's exclusive with the Ottawa Backhoe.

3 MORE POWER WITH THE "BIG MUSCLE"

The patented "Big Muscle" feature on the Ottawa heavy-duty Backhoe combines the use of a powerful hydraulic system with mechanical linkage to provide more digging power than is normally possible with the general run of hydraulically operated backhoe. This, too, is an exclusive advantage of the Ottawa Backhoe.



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OTTAWA, KANSAS

bank, and came to rest about 165 feet from the point where it left the pavement, injuring Bird and killing his wife. Testimony showed that there was snow or ice on at least a portion of the curve.

The holding of the court was that the State was not liable. "The exercise of reasonable care in maintenance does not require the State to go to the limits of human ingenuity to accomplish safety of the highway." According to the Court, "the proximate cause of this accident was not the negligence of the State but was rather the existing weather conditions and the negligence of the driver of the automobile."

Playground Problems

Lopez v. City of New York, 152 N.Y. Supp. (2d) 700, decided May 8, 1956, involved an injury to a child by a swing in a public playground.

The plaintiff was a ten-year old boy, who had just gotten off a swing. As he backed away from it, a girl mounted it and started "pumping" it. His rearward progress was interrupted by several children, and as the swing came back a second time, he was hit in the face. He sued the City of New York for \$17,500, for improperly constructing the swing area or for negligence in permitting it to become overcrowded.

The swing area was 26 feet by 43 feet, and was fenced off from the rest of the playground area. There were six swings in the area, and 15 to 20 children. Thus, 50 or more square feet were allowed per child.

The Court held there was no negligence on the part of the City, either in construction or in failing to provide immediate constant supervision of this particular portion of the playground.

More Than 100 Airfields in Alabama

The Alabama Department of Aeronautics reports that Alabama has 101 airfields, not including military bases and satellite fields, of which there are quite a few. Of these 101 airfields, 43 are publicly owned. These and 25 others are maintained for public use. The remaining 33 are classed as private fields and may be closed at any time. That makes 68 airfields in Alabama's basic airport system. In addition, the Department of Aeronautics now has on file applications or inquiries from 49 communities regarding assistance in building or improving airfields.

TAX-CONSCIOUS COMMUNITIES Specify CLAY PIPE for Economy

MENLO PARK SANITARY DISTRICT recently added more than 24,000 feet of Vitrified Clay Pipe sewers to serve the rapidly growing residential areas of San Mateo County, California. Since its founding, the District has installed approximately 150 miles of sewers.

District officials have been able to reduce tax rates consistently for the past several years, in spite of the national trend toward tax increases. Efficient operation is the key to this economy, and never-wear-out Clay Pipe plays an important part in keeping maintenance costs down. As District Superintendent Cedric Webster puts it: "Since the sewers are of Clay Pipe, we do not believe that they will ever need to be replaced."

DISTRICT OFFICIALS: Lawrence H. Cook, Secretary of Board of Trustees and Acting District Engineer
Cedric Webster, Superintendent
Frank Sasagawa, Inspector

CONTRACTOR: Pat Barkley Co.
John Coelho, Foreman



NATIONAL CLAY PIPE MANUFACTURERS, INC.

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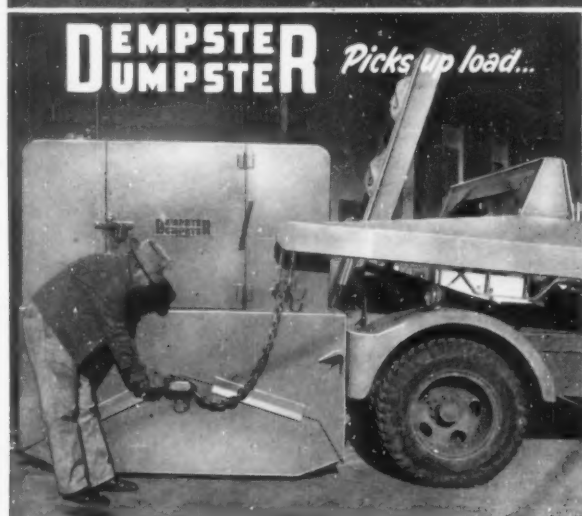
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and**



DEMPSTER

the solution to unsanitary costly bulk refuse collection...

... a simple, economical and nationally recognized solution to the problem of open cans, crates, etc, with overflowing loose refuse - - a costly potential in disease and fire hazards alone in damage to persons and property !

BIG STEEL DEMPSTER-DUMPSTER CONTAINERS—each equivalent to 75 ordinary trash cans—can be located at convenient bulk refuse accumulation points in your business areas . . . in housing and apartment areas . . . at schools, hospitals, etc. Scores of them—25, 30, 40, 50—served on pre-arranged schedule by only one man, the driver of your truck-mounted Dempster-Dumpster.

Invariably, wherever this system is installed, one finds immediate praise of an outstanding improvement from merchant users and citizens alike. Without question, the Dempster-Dumpster System is recognized as the most sanitary and lowest cost method of bulk refuse collection ever devised.

Without obligation on your part, our engineers will be glad to make a comprehensive fact-finding

survey to determine the savings you can expect by the use of this amazing system. For instance, a year ago the system was installed at Borger, Texas, and has proven to be the answer to our trash and garbage problems in the business districts", writes City Manager Fritz Thompson. Now, it is being enlarged and Mr. Thompson confirms what our original survey pointed out that the Dempster-Dumpster equipment is being amortized out of labor savings alone in approximately four years. In nearby Plain-

view for another example, Mayor C. L. Abernethy tells us "We have found, as your original survey pointed out, that the labor savings alone will amortize the cost of the Dempster-Dumpster System within the first three years of its operation." Plainview has one Dempster-Dumpster serving 58 containers. Write us today! Dempster Brothers, Inc.



Dumps it...



HERE ARE A FEW
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OF CITIES, LARGE AND
SMALL, USING THE
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MALL high performance, lightweight electric chain saws plug in anywhere—operate on 115 volt current (230 or 220 volt models also available)—or from portable or truck mounted generators, of 1,000 volts and higher. Capacities 12" to 26". MALL pneumatic chain saws, suitable for all jobs from tree trimming to cutting huge pilings under water are available in capacities of 12" to 42". Operate from stationary or truck mounted compressors. MALL'S famous MG line of gasoline engine chain saws are self-contained power units needing no outside source... lightweight, portable and powerful. Capacities 12" to 72".

**A complete
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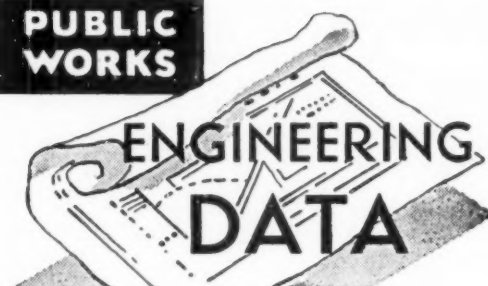
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**PUBLIC
WORKS**



Water and Sewerage Needs for a Growing City

For the twelve months through September, 1956, the growing city of Longview, Texas, made 412 water service connections and 385 sewer service connections, according to the report of R. A. Burnett, Water and Sewer Supt., sent us by B. A. Crocker, City Engineer. These new services, plus the demands elsewhere for additional facilities, required laying 61,600 feet of water mains, most of it 6-inch; and 55,700 feet of sewers. Also 46 fire hydrants were installed.

Results of Sewage Treatment at Marion, Ind.

In the attractive report of the Marion, Ind., City Sanitation Department, Gordon L. Watson, Supt., details the results of the operations of the activated sludge sewage treatment plant for 1955. The average per capita sewage flow was 168 gallons. Unit cost of treatment, based on cash disbursements, was \$40.69 per million gallons, compared to \$43.34 in 1954. BOD averaged 87 ppm in the raw sewage, 74 ppm in the primary effluent and 6 ppm in the final. Suspended solids average 221 ppm in the raw sewage, 87 ppm in the primary effluent and 13 ppm in the final. BOD applied per 1000 cu. ft. of tank capacity was 25.8 lbs.; 0.78 cu. ft. of air was applied per gallon of raw sewage and 1637 cu. ft. of air were required per pound of BOD removed. More than 24 million cu. ft. of digester gas were produced, which furnished 70.5 percent of the total power requirements of the plant. The estimated value of the digester gas used, at 50 cents per 1000 cu. ft., was \$11,856.65. It has been found that 1000 cu. ft. of digester gas is equivalent to 50 kwh. All buildings and digesters were also heated by the digester gas.

How Pure Are Atlantic City Breezes?

An air pollution analysis was made recently in Atlantic City, N. J., by the Phoenix Precision Instrument Company of Philadelphia with a mobile-mounted continuous recording aerosol photometer. This apparatus records the concentration of airborne foreign matter on a chart. The sensitivity of the unit is such that if a layer of fine dust one thousandth of an inch thick on a 1/4-inch circle were evenly distributed through a closed 10' x 15' x 8' room, the photometer would indicate the concentration by a 20 percent deflection of the meter scale. The unit can operate continuously.

A study of the graphs made at Atlantic City reveals that the resort air contains only 1/1000th as much foreign matter as many other inland cities of similar size—very little, in other words. The test, conducted in late September, was held at the same time that the American Chemical Society was conducting a symposium on air pollution in Atlantic City.



A.R.B.A. ROAD SHOW AND CONVENTION

What you'll hear there!

THE ARBA CONVENTION

will open Monday morning, January 28, 1957, with suitable ceremonies. For five days you will have the opportunity of attending the greatest seminar on roads and road construction ever gathered together. Every effort has been made to secure people of importance and authority to talk to you on the critical subjects of the industry.

You will hear:

- Senator Albert Gore of Tennessee
Chairman of the Senate Sub-Committee on Roads
- Senator Dennis Chavez of New Mexico
Chairman of the Senate Committee on Public Works
- Rep. George H. Fallon of Maryland
Author of the Highway Bill and
Chairman of the House Sub Committee on Roads
- Senator Francis Case of South Dakota
Ranking minority member of the
Senate Sub-Committee on Roads
- Rep. Charles Buckley of New York
Chairman of the House Sub-Committee on Public Works
- Rep. J. Harry McGregor of Ohio
Ranking minority member of the
House Sub-Committee on Roads

—and many other well-known authorities on the Road situation. These men have played a great part in the formation of the coming road program. No group knows the subject better.

Technical Sessions will begin Monday at 1:30 P.M. and *You will hear:*

- W. A. Warrick, Consulting Engineer of the John Clarkson Co. of Albany, N. Y.; and K. B. Woods, Head of the School of Civil Engineering, Purdue University. They are outstanding authorities on "The Design of Rigid Type Pavements."
- Fred F. Florence, President of the American Bankers Association (Republic National Bank of Dallas, Texas) will speak on "The Bankers' Part in the Accelerated Federal Aid Road Program."

- A. E. Johnson, Executive Secretary, American Assn. of State Highway Officials, Washington, D. C., talking on "State Financing of the Road Program."

- A. C. Clark, Deputy Commissioner, Engineering Div., U. S. Bureau of Public Roads. His address will be, "Engineering the Accelerated Road Program."

- George M. Foster, Chief Deputy Commissioner, Michigan State Highway Department, East Lansing, Michigan, will talk on "Building Roads with Modern Engineering Methods."

Other important subjects will be discussed by Nationally Known Experts.

- James W. Spencer, Highway Research and Extension Engineer, Department of Agricultural Engineering, Cornell University. President, Educational Div. of ARBA. He will discuss, "Keeping Highway Engineering Education Abreast of Modern Techniques."
- Fred Burggraf, Director, Highway Research Board, Washington, D. C., will give a report on "AASHO Illinois Test Road."
- J. E. Buchanan, President, The Asphalt Institute, University of Maryland, will give an address—"Bituminous Materials for Pavement Construction."
- C. Homer Cash, Road Engineer, Michigan State Highway Department, Lansing, Michigan, will talk about "Reinforcing Concrete Design Practice in Michigan."

There will be panel discussions on the many problems of the engineer and contractor. Photogrammetry, electric computers, traffic problems, maintenance, bituminous pavement construction, stabilization, financing, illumination and related subjects will all be treated in detail.

This is just a small part of the total program. **MAKE YOUR PLANS TO ALLOW SUITABLE TIME TO ATTEND THESE IMPORTANT SESSIONS.**

Jan. 28—Feb. 2, 1957

INTERNATIONAL AMPHITHEATRE

CHICAGO



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Electro-Matic®
FIRST...



"PR" COORDINATED TRAFFIC SIGNAL SYSTEM

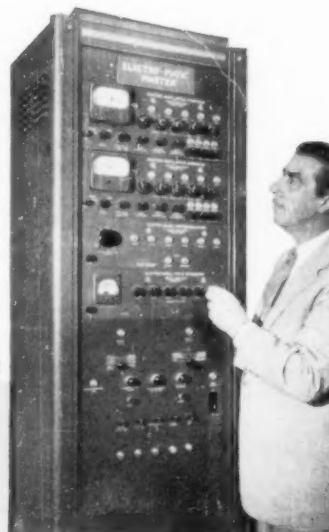
- Utilizes all of the traffic analyzing abilities of the Electro-Matic Master as well as the all-new, all-electronic PR local controllers.
- The Master selects cycles and offsets best suited to prevailing traffic conditions and feeds this information to the PR's at each intersection.
- The PR Controllers are first to embody all of the following features:

- Completely electronic
- Controls downtown grids or arteries
- Six cycle lengths—4 offsets—3 cycle splits—all determined by traffic volume and direction
- Offsets shifted smoothly by increasing or decreasing green intervals — eliminating long dwell periods
- Simple dial settings for Offsets and Cycle Splits
- Green intervals are traffic-adjusted while clearance and special intervals are constant at each intersection
- Maintenance-minded design includes printed timing circuit and accessible chassis construction

For details, write for Bulletin E-224



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More traction and stability

1482 sq. in. of ground contact, plus individually controlled stabilizers, let you work in soft or rough terrain, where rubber-tired rigs can't go...also anchors tractor, so you can dig tough material without being pulled into hole.

Revolutionary **TERRATRAC® BACKHOE** handles wider range of jobs at lower cost!



More year-'round versatility

Choice of front-mounted 3/4-yd. TerraTrac loader or dozer, gives you *two* cost-cutting tools in *one* — for big-production trenching, excavating, loading and back-filling jobs. One TerraTrac warranty covers COMPLETE machine.

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More power and speed

Special high-torque industrial engine, with torque converter drive and big capacity hydraulic pump, give you extra power for fast efficient digging, pulling heavy loads, or operating front-mounted equipment.

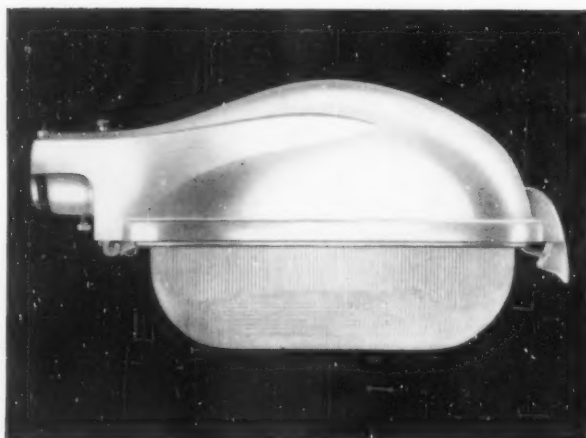


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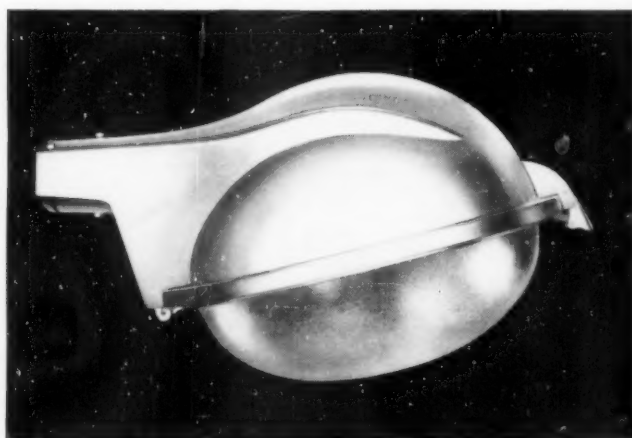
More strength and simplicity

Look at that husky welded steel box-section boom and dipper stick. This, together with powerful double-acting hydraulic cylinders enable you to dig more feet of trench, or move more yards per day...with exceptionally low operating and maintenance costs.

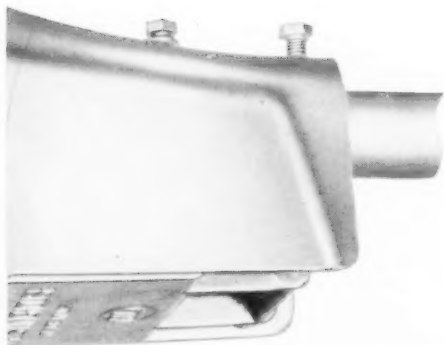




OV-20 uses 11,000-lumen CH-5, 15,000-lumen AH-1, 20,000-lumen EH-1, and 19,000-lumen JH-1 mercury lamps. Type II, III and IV distribution.



OV-60 uses 35,000-lumen AH-18, 33,000-lumen BH-18, 52,000-lumen AH-15, and 49,000-lumen BH-15 lamps. Type IV distribution.



New Westinghouse OV-35

*. . . the first luminaire designed specifically
for fluorescent mercury lamps*

Westinghouse, pioneer in the development of mercury street lighting — the OV-20 and OV-60 — now presents the OV-35 luminaire which can be used with the 400-watt J-H1 or the 700-watt B-H18 fluorescent mercury lamps.

This third member of the Westinghouse mercury group now offers you a complete selection of mercury luminaires for any roadway application — regardless of width or traffic conditions.

The new OV-35 is the first street-lighting luminaire to include a completely sealed optical system — bugs, dirt or moisture cannot get in. Like the OV-20 and the OV-60, this new luminaire assures the best possible night visibility and a greater uniformity of pavement brightness. It inherits their same outstanding plus features, too . . . such as one-piece cast aluminum housing, new optical system, one-hand maintenance, and smooth good looks.

Whatever your roadway lighting requirements, be sure to specify Westinghouse mercury luminaires. More information? See your nearby Westinghouse representative. Or, write Westinghouse Electric Corporation, Lighting Division, Edgewater Park, Cleveland, Ohio.

J-04405-X

WATCH WESTINGHOUSE!

WHERE BIG THINGS ARE HAPPENING FOR YOU!

CAT* No. 212

does a man's size job in Cle Elum



The City of Cle Elum, Washington, has 32 miles of streets and an average winter snowfall of 60 inches. All snow clearance is handled by a sturdy Caterpillar No. 212 Motor Grader, now 5 years old. With blade extended, it bucks the snow into windrows in the middle of the town's wide streets, leaving a traffic lane on each side. After one 14-inch fall the machine cleared the entire city in one shift!

Street Superintendent Angelo Sibillia says: "It's a wonderful piece of machinery. It gets the snow off the streets in a hurry—a great help in keeping the town functioning normally."

While the No. 212 is the smallest and lowest priced grader in the Caterpillar line, it's built with all the rugged stamina found in the larger machines. Its dependable 50 HP Cat Diesel Engine is balanced with weight, speed and traction for steady performance. And it's built throughout by one responsible manufacturer, backed by one reliable service source.

The No. 212 is an ideal machine for year-around

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WATER



PUBLIC WORKS
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Present and Future Estimates of Water Consumption

TO ESTABLISH data on which to base estimates of future water consumption, the Editor of PUBLIC WORKS wrote to a number of state sanitary engineers, consulting engineers and water works superintendents and engineers asking for data, for the 10-year periods from 1936 to 1976, on average water consumption in gallons per capita per day, peak day consumption and

peak hourly rates. The data for 1936, 1946 and this year are generally from actual records; the data for 1966 and 1976 were estimated on the basis of local knowledge and local conditions. In the section below are data from consulting engineers; sections on the following pages present data from water works superintendents and from state sanitary engineers.

I—By Consulting Engineers

Metcalf & Eddy, Boston, Mass., replied through Edwin B. Cobb who stated: "Values for per capita consumption must be used with consideration as to their background. Few water-works operators have close estimates of the population served by their systems. Many use the number of service connections multiplied by a factor of 3.5, 4.0 or more persons per service. This method of estimate is useful provided the multiplier is used consistently. Where multi-family dwellings are common, misleading results are possible. In other cases census figures have been used with obvious chances for error.

"Another factor which requires consideration is the amount of water consumed by industry from a particular system. Unless carefully analyzed for this factor, a comparison of water consumption figures between communities can be misleading.

In view of the above uncertainties, we have prepared Table 1 in which we list actual estimated values of per capita consumption for six municipalities which we have studied during the past few years. In the table we have indicated the allowances for future per capita consumption when we prepared our various reports.

"Considerable variations will be noted on comparison of the values between communities. In certain cases, little or no trend in values is noted, but where a tendency to increase is apparent it appears to be most pronounced after 1950. Some of such trends could be due to inaccuracies in estimating the rate of population growth following the 1950 census.

"In general we have recognized the possibility of future increase in per capita consumption, but without attempting to extrapolate apparent trends, we have used 100 gpcd as a convenient figure in recognition of the uncertainties of population estimates and other limitations.

"Of particular significance is the ratio of industrial to total use in the three industrial cities included. In these examples industrial use was 60, 63.3 and 57.4 percent respectively of the total consumption. The writer believes the narrow range of these percentages is significant.

"In answer to the question regarding peak daily usage of water we have prepared Table 2 in which we have tabulated the maximum one-day consumptions as percent-

Table 1—Data from Metcalf & Eddy on Average Daily Domestic Consumption, gpcd.

Year	Town A	Town B	City C	City D	City E	City F
1945	65	..	..	84	..	..
1946	95	67	..	97	56*	68*
1947	70	95	..	97	62	71
1948	78	92	69	99	61	79
1949	88	111	69	102	60	76
1950	88	96	69	98	57	73
1951	85	93	70	103	57	78
1952	88	95	68	105	64	83
1953	91	101	64	105	..	80
1954	..	..	..	..	77	90
1955	103	..	..	..	83	92
1965	..	..	..	..	..	96
1975	100	100	75	120	100	100

*July 1, 1945 to June 30, 1946

Town A—Largely residential—includes all water used—recent industrial development has consumption of unanticipated magnitude—estimate made in 1953—population 16,300.

Town B—Largely residential—includes all water used—population 7,700.

City C—Industrial city in Connecticut—includes domestic, commercial, municipal uses and unaccounted for water—in 1953-54 industrial use was 60 per cent of total use—population 24,000.

City D—High type residential city in New York area—includes all water used—population 43,500.

City E—Industrial City in midwest—includes residential, municipal uses and unaccounted for water—in 1954-55 industries, apartment houses, hotels and railroads uses were 63.3 percent of total use—population 163,000.

City F—Industrial city in mid-Atlantic states—Includes domestic use, free water and unaccounted for water—in 1954-55 industry and business used 57.4 percent of total—population 139,000.

Table 2—Data from Metcalf & Eddy Showing Relation of Maximum One-Day Consumption to Average Consumption (percent)

Year	Town A	Town B	City C	City D	City E	City F
1945	161	..	..	..	..	..
1946	153	..	..	..	..	..
1947	218	..	..	..	..	129
1948	191	..	..	127	..	129
1949	212	238	..	149	..	181
1950	221	219	142	128	146	146
1951	183	216	162	128	138	131
1952	232	233	142	143	154	137
1953	212	220	133	147	151	136
1954	..	..	156	..	149	165
1955	228	..	..	..	154	153
Recommended Allowance	225	235	165	150	150	180

ages of the average daily consumption for the same six municipalities. Also included in this table are our recommendations in each instance for allowances to be used in design. No significant trends can be noted in the tabulated values.

"Reliable figures for maximum-hour consumption are generally not readily available. The effects of storage on such information is so variable as to render most data totally misleading."

Gannett Fleming Corddry and Carpenter, Inc., Harrisburg, Pa., replied through C. C. Wilbur, Chief of the Water Division. Mr. Wilbur says: "In 1953, we made a careful analysis of the water consumption of the city of Lancaster, Pa. Population served today is estimated at 75,000 and was just under 70,000 in 1950. This city is heavily industrial; one consumer alone used 1 mgd in 1952, and is now using 3 mgd. Of a

daily total pumpage in 1952 of 11 mgd average, this is a sizable amount.

"For Lancaster we estimate an annual increase of 1.3 gpcd for 20 years; and a probable consumption in 1966 of 174 and in 1976 of 184 gpcd. The maximum day in 1966 is estimated at 234 gpcd and in 1976 at 250. The maximum hour for 1966 is estimated at 304 gpcd and in 1976 at 325.

"We have developed somewhat different values for Pennsylvania

communities of 10,000 population or less. For these, the annual increase is 1 gpcd for twenty years, with a probable consumption in 1966 of 110 and in 1976 of 120 gpcd. The maximum day will be 140 gpcd in 1966, going to 155 in 1976. The maximum hour in 1966 will be 168 gpcd, rising to 200 in 1976."

Alden E. Stilson & Associates, Columbus, O., replied through Mr. Stilson. "Estimating future consumption is a matter of educated guesswork based on a study of local conditions and comparisons with past experiences. We believe water consumption of individuals in homes will continue to increase at the rate of 1 percent a year; and that these individuals will be using, for home purposes, 50 gpcd in 1966 and 55 gpcd in 1976. This does not include commercial and industrial uses.

"For cities in Ohio, considering the population as a whole and including municipal and commercial uses, but not industrial process water, the following are reasonable expectancies for water use: Population 1,000 to 5,000, 40 gpcd; 5,000 to 10,000, 50 gpcd; 10,000 to 25,000, 60 gpcd; 25,000 to 100,000, 75 gpcd; 100,000 to 500,000, 125 gpcd; 500,000 to 1,000,000 150 gpcd; and 1,000,000 and over 200 gpcd.

"To these figures add 5 percent for 1966 and 1 percent for 1976. The maximum day will be about 175 percent of the average and the maximum hour will be 300 percent."

Russell & Axon, St. Louis, Mo., estimate that consumption in gallons per day per person will increase 2 percent a year for the next 20 years. The probable average consumption per person per day in 1966 will be 100 gallons, and in 1976, 120 gallons. The maximum day in 1966 will be 150 percent of the average, and in 1976, 160 percent. The maximum hour usage will be 225 percent of the average in 1966 and 250 percent in 1976.

Black & Veatch, Kansas City, Mo., reply by E. L. Filby. In Aberdeen, S. D., with a 1956 population of 23,600 average daily per capita use was 102 gals.; the maximum day use 5.4 mgd; and the maximum

Table 3—Estimate by Forrest & Cotton of Probable Water Use in Texas Cities

	Small	Medium	Large
1955 use, gpcd	80	110	140
Annual increase gpcd	1	1.5	2.2
Probable 1966	91	126	164
" 1976	101	141	186

hour pumpage at the rate of 12.5 mgd. For 1966, estimates of corresponding figures are: Population 29,500; 116 gpcd; 8.1 mgd; and 23 mgd. For 1976, population is estimated at 34,700; per capita use 126 gals; maximum day pumpage 10.8 mgd; and maximum hourly rate of pumpage 28 mgd.

Essentially the same data are presented for Memphis, Tenn., with a 1956 population of 460,000, 125 average gpcd; maximum day pumpage 88 mgd; maximum hourly rate 138 mgd. For 1966, the corresponding figures are population 550,000; 135 gpcd; 110 mgd; and 164 mgd. For 1976, 635,000; 142 gpcd; 137 mgd; and 187 mgd.

Forrest & Cotton, Dallas, Tex., replied through Karl Hoeftle who says: "Daily water consumption per person varies widely in Texas, being modified by size and character of the community, and also by its location. In the drier western areas, per capita domestic use usually is considerably greater than in a comparable community in East Texas. Statements must therefore be limited to definite areas.

"In this area of Northeast Texas, the general data in Table 3 may be accepted as being close to the mark for small (around 5,000 population), medium (around 25,000) and large (around 300,000) cities.

"The annual rates of increase are consistent with trends indicated over the past decade, uninfluenced by large industrial uses. But such figures may not be used for design factors. An individual study and determination must be made of each community itself.

"The relationships between maximum day and maximum hour are more constant. In this area they are influenced almost entirely by temperature and precipitation (or lack of it). Many determinations made from records have led to the adoption in this office of the following relationships: Maximum day to average day 200 percent; Maximum hour to average day 365 percent."

Ripple & Howe, Inc., Denver, Colo., replied through V. A. Vaseen: "Current use of water for domestic purpose regardless of irrigation seems to be approximately 250 gallons per tap per day. This is for a family consisting of approximately 3½ persons, which is approximately 70 gallons per person per day. In reviewing back over a ten-year period, this seems to be an increase from 65 to 68 gallons per person per day to 70 gallons per person per day. If this rate were to be a flat curve, we could probably as-

sume that this would increase to approximately 75 gallons per capita per day in 1966; thence to 80 gallons per capita per day in 1976.

"Concerning maximum rates in use per capita per day, we have not made an exacting study, but it appears that the maximum day, other than emergency use, approaches 500 gallons per tap per day, or ap-

proximately 150 gallons per capita per day, or two times the average day. Maximum day then, in 1966 can probably be presumed to be at the same ratio as above.

"Maximum hour, in most cases, has been approximately two and one-half times the average day. We presume this will be equally true in 1966 and 1976."

II—By Water Works Engineers

TO DETERMINE the best opinion on the future rates of water use, letters were addressed to about 35 cities early in 1956. The questions asked included data on average water consumption in gallons per person per day for the past twenty years, and the best estimate of what the consumption would be ten years and twenty years hence; also, the same data for the maximum day and the maximum hour.

The cities were carefully selected to cover representative areas of the country and a number of relatively small cities were included. The 27 replies are quite representative. Tabulations from the replies are shown in Tables 4, 5 and 6 for average day, maximum day and maximum hour.

Interesting facts were developed from studies of the replies and many tabulations were made which are not shown herewith. Average consumption for all 27 cities was

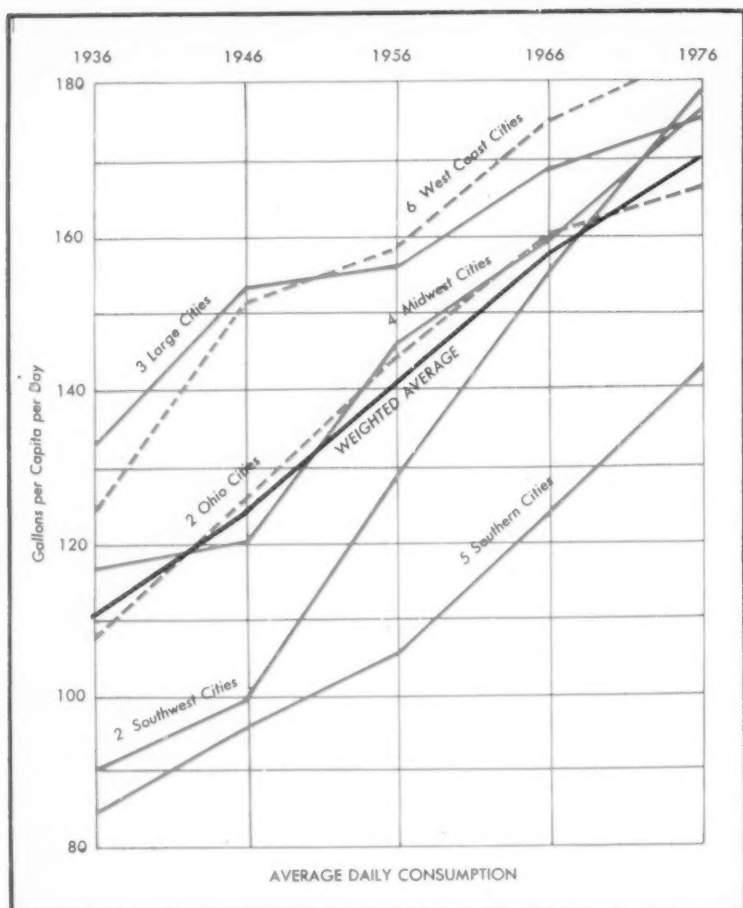
109.5 gpcd in 1936; 124 gpcd in 1946; and 139.5 as of the present. The estimate for ten years hence is 157 gpcd; and for 1976 it is 170 gallons. Despite frequent large differences in individual cities, the figures are remarkably uniform for the various sections of the country.

The increase in average use for all the cities was 1.45 gpcd per year for the 1936-1946 period; and 1.55 gpcd annually for 1946 to the present time. The average increase per year for the next decade is estimated at 1.75 gpcd; and for the period 1966 to 1976 at 1.30 gpcd per year. In this connection, some interesting comments were made in letters to the Editor.

The Hartford Metropolitan District, Hartford, Conn., W. A. Gentner, Deputy Manager and Chief Engineer, says population has been estimated to increase 1¼ percent and total use of water 2¾ percent per year.

Table 4—Average Water Consumption, GPCD, Past and Estimated Future by Water Works Superintendents

City & State	1936	1946	1956	1966	1976
New York, N. Y.	134	146	138	153	162
Baltimore, Md.	131	150	159	174	188
Philadelphia, Pa.	...	163	171	180	188
Springfield, Mass.	100	127	175	230	278
Hartford, Conn.	80	100	111	122	134
Charlotte, N. C.	79	96	109	144	178
Lynchburg, Va.	83	95	114	134	156
Raleigh, N. C.	...	82	102	120	136
Baton Rouge, La.	88	89	85	93	102
Atlanta, Ga.	99	115	122	130	138
Buffalo, N. Y.	210	214	242	...	...
Toledo, Ohio	123	127	149	169	171
Akron, Ohio	91	120	138	150	162
Cedar Rapids, Ia.	...	91	136	170	200
Madison, Wisc.	110	135	150	160	175
Des Moines, Ia.	100	100	114	117	125
Omaha, Nebr.	140	156	181	190	207
Wichita, Kans.	93	117	146	148	160
Oklahoma City, Okla.	79	82	114	154	183
Dallas, Texas	100	116	143	158	175
Austin, Texas	99	122	140	140	138
Sacramento, Calif.	210	258	236	240	250
Oakland, Calif.	72	102	130	159	177
Portland, Ore. (Water Auth.)	97	114	104	115	120
San Diego Co., Calif.	...	162	180	190	190
San Diego, Calif.	114	139	126	140	145
Salem, Ore.	...	139	156	207	224



● MUNICIPAL water use increase, past and projected, is about 1.5 gpcd per year.

Table 5—Maximum Per Capita Per Day Water Use, Past and Estimated Future, by Water Works Superintendents

City & State	1936	1946	1956	1966	1976
New York, N. Y.	182	174	172	190	200
Baltimore, Md.	...	171	206	243	271
Philadelphia, Pa.	...	195	221	230	240
Springfield, Mass.	135	195	285	284	308
Hartford, Conn.	106	132	161	177	194
Charlotte, N. C.	103	132	157	195	243
Lynchburg, Va.	118	126	152	190	225
Raleigh, N. C.	...	89	153	179	206
Baton Rouge, La.	114	115	112	123	135
Atlanta, Ga.	128	145	170	189	208
Buffalo, N. Y.	286	287	243	...	...
Toledo, O.	185	179	235	264	267
Akron, O.	147	157	197	217	244
Cedar Rapids, Ia.	...	...	230	280	320
Madison, Wisc.	220	250	300	320	350
Des Moines, Ia.	161	142	184	200	215
Omaha, Nebr.	254	264	428	440	440
Wichita, Kans.	175	219	292	317	320
Oklahoma City, Okla.	137	167	221	321	383
Dallas, Texas	194	226	277	306	340
Austin, Texas	237	237	312	275	276
Sacramento, Calif.	358	436	424	440	450
Oakland, Calif.	108	174	200	247	267
Portland, Ore.	179	243	237	245	250
San Diego, Calif.	176	191	199	210	220
Salem, Ore.	...	340	385	450	475

In Baton Rouge, La., according to D. R. Taylor, General Manager of the Water Works Co., no industries are served, all of them taking water from the Mississippi or from wells; also complete metering has resulted in only small increases in consumption.

Paul Weir, General Manager of the Atlanta, Ga., Water Works, reports that average water consumption has increased at the rate of 0.84 gal. per person per year since 1900. The curve of consumption shows a rapid increase from 1900 to 1920; a flat slope from 1920 to 1940; and another rapid increase since then.

In San Diego Co., Calif., Richard Holmgren, reports that much of the water is used for irrigation of citrus and avocado groves, but he believes this agricultural use will level off and then on there will be only a gradual increase in domestic use, probably resulting in a lower overall per capita use.

"There are factors working both ways in Philadelphia," says Samuel S. Baxter, Water Commissioner. "We are now in the process of metering 18,000 of our residential properties which were not metered. Our total customers number about 510,000. Since all of the properties now being metered are from 40 to more than 100 years old, I am sure there will be some saving in water due to repair of leaky fixtures, etc., after the first metered bills go out.

"Air conditioning has some effect on per capita consumption, though our per capita use in Philadelphia has remained nearly constant for the past 2 or 3 years. I do not think air conditioning will show up to a large extent in Philadelphia since we are an industrial city with a reasonably high per capita use.

"One local factor is the accuracy of our meters. Until very recently, meters were replaced only when they were damaged or when the meter practically stopped operating. Last year, we started a system of rotation of meters, based on a 10-year service period."

Maximum Day Use

Maximum day consumption for the 26 of the 27 cities is shown in Table 5. The average reported for 1936 was 176 gpcd; in 1946 the average was 196, showing an increase of 2.0 gals. per person per day annually. This year, an average use of 235 gpcd is reported, an increase of 3.9 gpcd per year for the past decade. The estimates for 1966 are 261 and for 1976 281 gpcd.

Hartford reports that the maximum 24-hour consumption aver-

Table 6—Maximum Hourly Water Use, Past and Estimated Future, by Water Works Superintendents, GPCD

City & State	1936	1946	1956	1966	1976
New York, N. Y.	228	218	215	240	250
Baltimore, Md.	...	...	282	337	377
Philadelphia, Pa.	...	253	286	300	215
Springfield, Mass.	199	246	400	440	477
Hartford, Conn.	145	175	195	214	235
Charlotte, N. C.	165	204	237	305	379
Lynchburg, Va.	...	...	450	575	700
Raleigh, N. C.	...	148	255	298	342
Baton Rouge, La.	173	175	167	184	202
Atlanta, Ga.	192	218	255	284	312
Buffalo, N. Y.	334	348	410	...	...
Toledo, O.	272	288	340	374	390
Akron, O.	208	270	310	345	382
Madison, Wisc.	246	300	360	384	420
Des Moines, Ia.	232	202	236	266	286
Omaha, Nebr.	297	309	500	515	515
Oklahoma City, Okla.	203	280	447	730	878
Dallas, Texas	334	388	476	526	585
Austin, Texas	...	370	500	440	440
Sacramento, Calif.	495	505	545	575	600
Salem, Ore.	...	510	575	675	710

ages about 145 percent of the average. The maximum day consumption in Atlanta has increased at the rate of 1.9 gallons per capita per year since 1930.

Maximum Hourly Use

The maximum hourly use has increased markedly but most rapidly

in the past ten years. From 1936 to 1946, the annual increase was 2.5 gallons per person per day, from an average of 283 to an average of 308 gpcd. In the next ten years, the average rate of use increased from 308 to 381 gpcd, or 7.3 gallons per person per day annually. Estimates for the future are for rates of 426

gpcd in 1966 and 458 gpcd in 1976.

These are short time rates, of course. While they do not represent the use of such a large volume of water, they do constitute a very serious water works operating problem. Storage facilities and distribution lines may be seriously overloaded.

In Wichita, Kans., according to T. J. Scanlon, Dept. of Water Supply and Sewage Treatment, in late July, 1954, a rate of 110 mgd per day was pumped for approximately 35 minutes, or 504.6 gpcd rate.

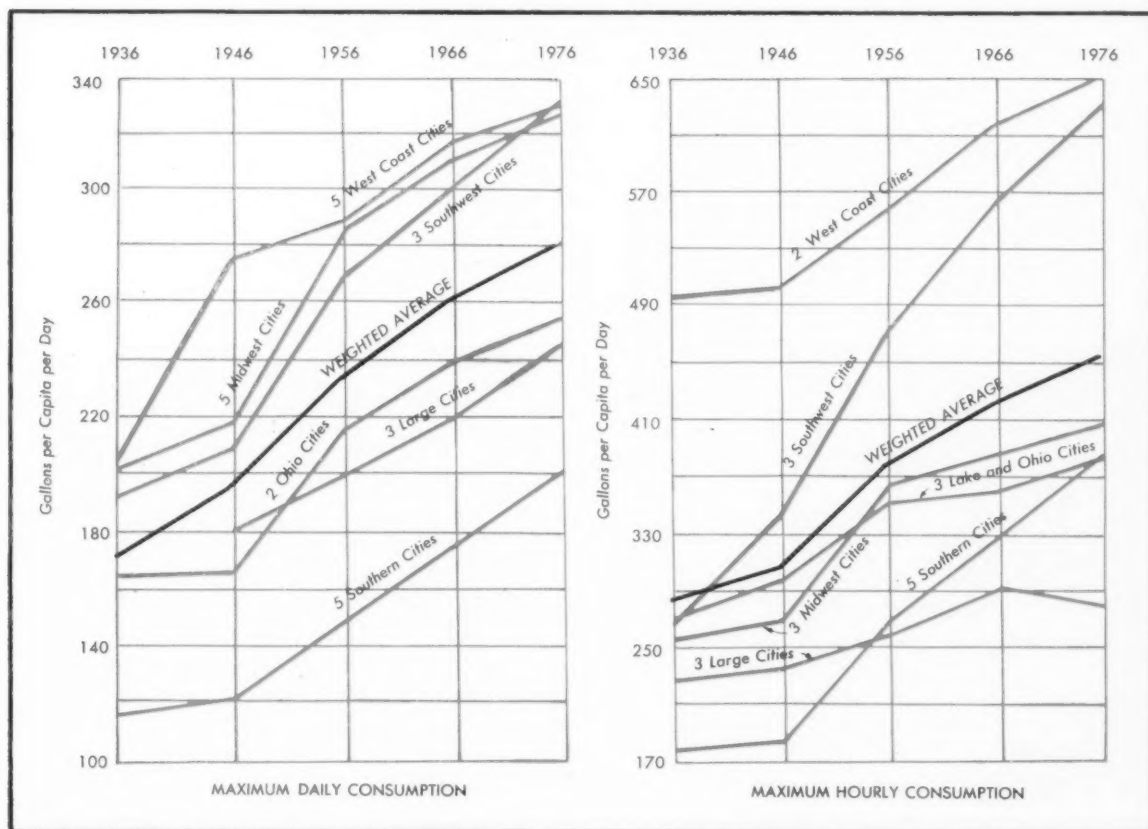
George A. Marshall, Sup't. of the Water Dept., Portland, Ore., reports a maximum hourly rate of 29.7 gpc in 1936; 40.6 in 1946; 39.6 in 1955-6; and estimated rates of 40.8 in 1966 and 41.6 in 1976.

Hartford reports maximum hourly use is about 175 percent of the average annual daily use.

Application of Data

The information has been presented so as to facilitate its use in planning water developments in the future. The principal sections of the country are represented and various types of cities are covered. Thus, it

(Continued on page 152)



● WATER WORKS Superintendents expect maximum daily and hourly water consumption to increase less rapidly after 1956.

MAINTENANCE and ROUTINE BETTERMENTS *by Contract*

C. W. McCAUGHEY,

Deputy Director,

Division of Operations,

Ohio Department of Highways

FOR MANY YEARS the Ohio Highway Department, by virtue of legislative limitation, has been committed to the general use of the contract method. This has gradually been expanded to a point where not only all construction projects in their entirety, but also a great majority of other items amenable to contractual procedure are now customarily done very satisfactorily by contract. These cover a very sizeable dollar volume of operations generally considered as maintenance and routine betterments.

A few definitions and pertinent comments may be in order, because of the fact that AASHO contacts during recent years have shown quite clearly that no two States are in complete agreement on the



answers to a great many highway matters. For example, the word "contract" to this Department means exactly what it means to industry: the furnishing of the completed product, including all materials and labor, by the successful bidder who was awarded the project on open competition, the State furnishing supervision only. Any work is amenable to contracting where there is a definite black-on-white possibility to produce the required meeting of minds.

When one gets down to defining "maintenance", a great variety of definitions exists. By maintenance

is meant the preservation and keeping of each type of roadway, structure and facility as nearly as possible in its original condition as constructed, or as subsequently improved; and the operations of its facilities and services to provide at all times satisfactory, safe and economical highway transportation. Uppermost in mind is the conviction that the highway should always be a dedicated servant to its user. The question of so-called maintenance betterments should therefore be readily resolved by the States and viewed, not as technicalities, but solely as service factors and not items of construction or maintenance.

And perhaps the phrase "very satisfactory" may need amplification. We, in Ohio, have found contract maintenance to be generally quickly completed and of very good quality, often superior; always of fair and definite cost and often unquestionably at lower cost than if done by State forces; an excellent safeguard in helping us to maintain a fixed manpower requirement and



● GUARD RAIL painting is done by contract. All such work is one-coat, but either spray or hand painting is permitted.



● CHEMICAL weed control is also a contract item. Spray is carefully controlled so roadside crops are not damaged.

an equipment need at the lowest possible level. These are factors well worth weighing, especially through periods of industrial development; in fact, our maintenance payroll (we have no construction force) has been gradually decreasing year after year without showing any adverse effect on our roadways.

Five Yardsticks

Over the years we have learned that there are only five yardsticks that govern the possibilities of development of the field of contract maintenance. They are:

- 1) The repetitive nature of an item, year after year, rather than its actual dollar volume. Dozens of items fall within this group, such as painting and repair of guard rail and structures; subsealing; weed control; tree trimming and removal; joint and crack sealing; pavement patching; roadside improvement; furnishing materials; material production; surface treatments, resurfacing; and stabilization work.
- 2) The adaptability of the item to unit evaluation, for purposes of estimating, bidding, performance and payment.
- 3) The vital necessity of definitely locating all elements of an item with respect to the details of the work required, quantities and specifications; and the accurate spotting of these elements on a map attached to the invitation to bid.
- 4) Inspection, both adequate and trained, with individual adaptability for the type of work.
- 5) The possibility of profit.

In Ohio we have found that by making our contract work repetitive, expanding it gradually over the years, a highly competent group of contractors has developed for each

type of work. Quite naturally the profit incentive has played its part all along. Qualified bidders are just as earnestly watching for guard rail painting work at 6¢ to 8¢ per lineal foot as are contractors qualified for resurfacing.

A very recent addition to our contract maintenance family is weed spraying. It was started in one county about five years ago and its advantages and weaknesses were demonstrated. Since then it has expanded widely and is apparently viewed so favorably by the contractors that in a few years it will probably include all of the State's rural mileage. After the second contract weed spraying season was over, it became quite evident that all but yardstick No. 4 had been satisfactorily answered — Inspection; and this yardstick now appears to be working out.

As a few illustrations of our general approach to the problems arising in contract maintenance, it might be well to cite our performance on a few 1955 items. For example, about 1.25 million lineal feet of guard rail were painted by contract and almost ½ million by state forces. The contract percentage is controlled by several factors, the more important being that the rail be grouped and that a one-coat job be suitable; whereas, isolated sections and those requiring two or three coats were painted by state forces. Likewise, guard rail reconstruction: about 100,000 lineal feet by contract, all new

material; about two-thirds as much by state forces, mostly of salvaged materials.

There were 11 contracts for painting 134 bridges during 1955, whereas 35 small isolated structures were painted by state forces. An effort is always made to encourage competition on the bidding for all types of work; and in this instance, painting the 35 small structures by state forces helped us get better bids on the painting of the larger structures by contract. Bridge repair work, coming within the province of maintenance, usually falls short when measured by yardsticks 2 and 3, although some bridge repair work can be set up into definite contracts. Repairs were made on 434 structures during 1955, 16 of which were by contract at a cost of \$204,300.

On bridge failures, due to whatever emergency, the need for instant action is ever present and the authority of our State supports us in taking such action. Time is generally unavailable for advertising or for the development of plans for contract work, since normal traffic must be restored as quickly as possible. On numerous occasions, state forces, utilizing emergency stock on hand, have repeatedly restored traffic over an adequate temporary structure in much less time than would have been required for the



● **SUBSEALING pavements:** Holes are spotted in advance and workman wears safety shield to prevent burns from splashout.



● **ABUTMENT of bridge is repaired by contract after storm damage.** Bridge painting is also standard contract procedure.

advertising. Nine such emergencies were quickly completed by state forces during 1955 at a cost of \$64,110.

Patching pavements is still being studied carefully for contracting in Ohio, but to date very little of this work has been done by contract except in conjunction with other work. Subsealing was unusually low during 1955, but will probably be a sizeable item in 1956. Weed control in 1955 was done by contract in 64 of Ohio's 88 counties; in some counties by a complete 3-spray (early—midseason—late), and others by 2-spray and 1-spray. In subsequent years these latter counties will be expanded to 3-spray and other counties will be added to the contract program. The remaining counties were sprayed in 1955 in whole or part by state forces. Spraying has already demonstrated a very definite saving in overall weed control on the State System, as well as decreasing materially the spread of various undesirable growths. Excellent grass shoulders and roadway result.

Spraying is done under the supervision of our landscape engineer, the contracting unit being the mile. He has had considerable success also in contracting the removal of dead trees, pruning and planting. In such work the contract unit is the tree when removed; pruning, planting, seeding and erosion control are contracted by the mile. Among the various items 1989 trees were removed and 880 miles of pruning were done.

Some emphasis has been given above to weed control, since it so clearly demonstrates the plan of approach to the general problems involved in the development of maintenance contract work.

By far the largest dollar volume of our maintenance contract work was done on surfaces, including a very sizeable amount of materials furnished and spread on both sur-

faces and shoulders; and also material stocked. Because of its large manpower requirement, most of this work is always contracted, state forces performing only the isolated and the early and late work.

The volume of high type asphaltic concrete work performed under maintenance consisted of the light resurfacing of 630 miles of pavement. Approximately 465 miles of roadmixes were contracted and 850 miles of surface treatment; also about 500 miles of bituminous dust laying.

In materials used, this surface contract work done in 1955 required the use of about 9 million gallons of bituminous materials, whereas in surface treatments and roadmixes some 2 million gallons were used by state forces. About 280,000 tons of high type asphaltic concrete were used on contract work, and a few thousand tons of it were used by maintenance forces in drag patching. Over a half million tons of aggregate were contracted.

Snow and Ice Work

Each winter the Ohio Department of Highways spends four to five million dollars in snow and ice work, performing the necessary operations almost entirely with its own regular forces. During extreme conditions, contractors' equipment has been rented at rates fixed in advance. In general, however, we have found no contract substitute for the almost automatic and willing service of our county maintenance organizations, who report diligently at the first sign of snowfall or a freeze after a rain, and often carry on night and day, to near exhaustion. In the timely performance of this work we are uniquely proud, and we doubt seriously if we will ever find its contract counterpart. For this work, round-the-clock radio and teletype service is maintained statewide from December 1 to April 1.

Our study of contract maintenance nationwide shows clearly that the contract idea is growing in favor wherever the opportunity is afforded. We have long since learned that where permitted, it stabilizes work forces and equipment needs at such a very desirable low level as to promote real economy; that it encourages the more prompt and more efficient performance of day-to-day routine maintenance; and that it assists us in many ways to better serve traffic day by day—as we feel should always be expected of all who consider themselves to be highway engineers.

CAMERAS

THE MAINTENANCE and particularly the inspection of underground water and sewer lines has always posed a problem to public works officials. Their decision to inspect rumored or suspected leaks in these lines usually means not only great expense but serious inconvenience and some danger to motorists and pedestrians due to the long, open excavation lines. Sending a man through the larger sewer lines is risking a human life, while in the smaller lines such an undertaking is impossible.

Such a problem faced Fresno, Calif. and Public Works Commissioner A. Segel this summer. Persistent rumors had been plaguing his office that part of the city's main outfall sewer line at a depth of 26 ft. had caved in. The 54-inch line had been laid in sandy soil, and excavating along the 625 feet of the line would necessitate the use of heavy sheet piling or a trench at least 60 feet wide. The rapid flow of the raw sewage, much of which came from food processing plants nearby, made sending a man through the sewer prohibitive at any time except early in the morning. Even then and with extensive oxygen supplies, safety lines and spark-proof lights, clothing and shoes, the risk would be tremendous.

Without using either of these methods, Segel was able to determine not only that the rumors were false and that the line is in perfect condition, but he also was able to estimate that the line has a useful lifetime of 35 to 50 years. This was vividly shown through 250 pairs of stereoscopic pictures which were taken by a waterproof camera which crept through the line on spraddled wheels taking pictures every two and one-half feet. No excavating was necessary, no one's life was jeopardized.

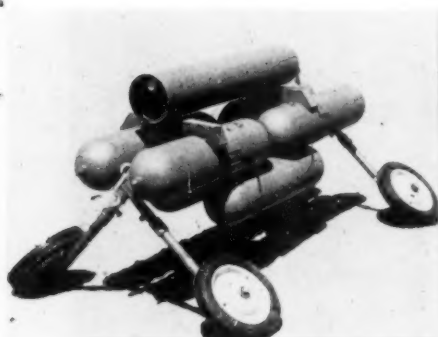
The alignment of the wheels upon which the camera was mounted was done above the surface. Careful attention was taken to prevent the camera and its mounting from deviating from a straight course through the sewer line. Then the camera and its mounting were lowered through an existing manhole and placed on the bottom of the line. A cable from a winch at



● SLICK areas that develop are spotted and corrected by contract work.

PROVIDE

Underground Surveys of WATER LINES and SEWERS



● THIS is the "straddle bug" which is used to photograph insides of pipes.

another manhole, 1,300 to 1,400 feet away if necessary, was floated downstream to the camera and was hooked on. A tag line behind the camera served as a safety check against the remote possibility of the front cable becoming loose.

The camera was operated electrically, through a trailing cable, and air tanks, serving like pontoons on a boat, kept the "jet propelled straddle bug" from being submerged in any unexpected holes or from being hung up on any solid.

While it was not necessary in the Fresno operation, the camera is capable of covering about three-eighths of a mile with pictures at 5-foot intervals before being reloaded. At bends the camera can be brought up through another manhole, realigned and sent on.

Through this operation, the City of Fresno obtained full pictorial assurance of the satisfactory condition of the sewer line at a total cost of \$250. Segel says this represents a saving of thousands of dollars and effectively squelched the rumor.

"The straddle bug" is possibly the most spectacular of cameras capable of inspecting sewer and water lines six inches to six feet in diameter and are the inventions of Claude C.

● INSIDE or "bug-eye" view of the interior of a Fresno sewer. Each picture shows area 30 to 40 ft. in advance.

Laval, Jr. These devices and special rigs for photographing and repairing water wells now are licensed to Laval Underground Surveys.

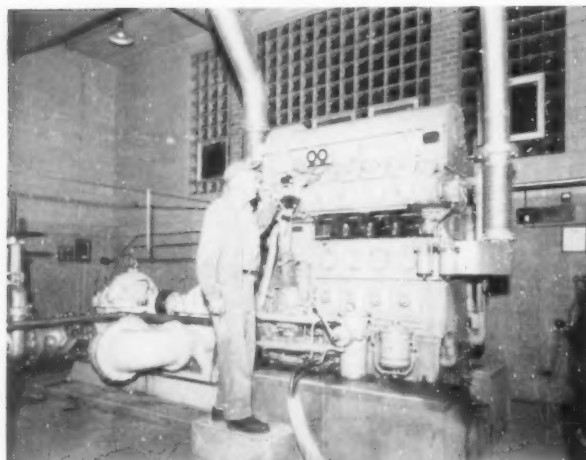
The organization's operations are not limited to inspecting for possible damage. The cameras are used for inspecting new lines for acceptance of the installation and for inspecting lines which are under consideration for purchase. Since the pictures are taken at maximum intervals of five feet and since each individual photograph in the larger lines shows conditions 30 to 40 feet ahead, it would be almost impossible to fail to detect a structural fault. The pictures also will show an unevenness or cracks in the line in addition to any roots or obstructive debris. Of course, we can also locate and determine the extent of damage so that excavating lines for repair work can be limited to the trouble area. The camera can travel 10 to 20 feet a minute, and at the five-foot interval rate, it would be taking a picture every 15 seconds.

So far the largest job in terms of distance covered was done in Contra Costa County, Calif., where three miles of six-inch line were surveyed when a new sewer system was un-

able to handle the flow for which it had been designed. Here the camera had to forego its staddled legs and was sent through the line on a sled. The pictures readily detected faulty joints in the line which were allowing water to drain into it from the surrounding clay soil.

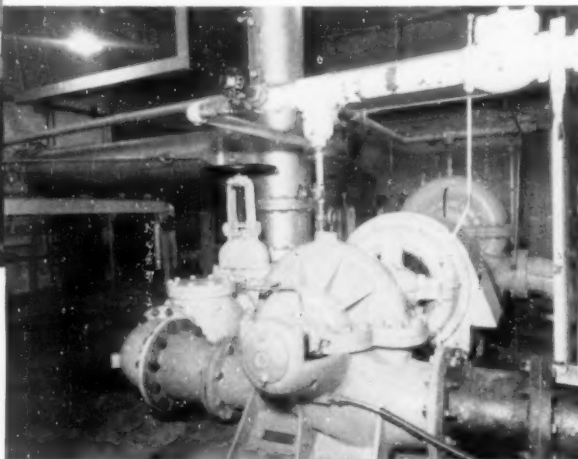
Laval Underground Surveys first applied photographic detection methods in connection with the highly expensive water wells in the extensively agricultural San Joaquin Valley of California. The use of this camera gave repair crews a pictorial blueprint of what should be done rather than going ahead only on above-surface speculations. Laval then perfected an electro-hydraulic swage which can be lowered into the damaged portion of a well and, by pre-determined gauges, can push collapsed portions of the well back into shape making possible the installation of new well liners without the risk of permanently damaging the well. This can be done at any depth with no apparent limit. The company regularly repairs wells at depths greater than 2,300 feet, and has operated the equipment at the 6,000-foot level, using a strengthened camera.





● OPERATOR is shown pushing small lever which starts the 300-hp diesel engine. This drives the pumps shown at left.

● SMALL new pump in foreground delivers 18.2 percent more water than old pump in rear, but uses the same power.



DIESEL PUMP TEAM CUTS

Water Pumping Costs

THE WATER PUMPING STATION at Canandaigua, N. Y., has realized an important reduction in operating expenses and has guarded against electrical power failure with the installation of a Fairbanks-Morse 300-hp diesel engine driving a pair of new F-M 10-in. centrifugal pump. Installed in 1954 as a standby unit, since the old equipment has been in operation for many years, it soon became evident that a 50 percent saving could be effected when the diesel-driven pumps were operated on a daily basis. An additional saving has been achieved with the installation, in 1955, of an 8-in. F-M centrifugal pump to replace a thirty-year old electrically-driven unit. Driven off the same electric motor, the new pump handles an 18.2 percent greater volume and has increased pumping capacity by 500,-000 gpd.

The two new 10-in. diesel-driven centrifugal pumps operate in series. Designed to pump 2500 gpm at a net head of 304 feet, they have consistently averaged 2800 gpm under actual working conditions. This team has been used on a daily basis since the switch was thrown in 1954.

In 1955, the West Lake Road station pumped a total of 668,666,000 gallons of water, 12.5 percent more than in the preceding twelve-month

period, or an average increase of 6,216,000 gallons per month. During the peak month of July, 1955, the station pumped 73,348,000 gallons, a 20.1 percent greater volume than the corresponding month in 1954. Community growth, increased per capita consumer demand and a large veteran's hospital have all contributed to the additional 74,590,000 gallons pumped in 1955.

Prior to installing the F-M diesel-driven pumps, the West Lake Road station spent \$24.68 for power to pump a million gallons of water, this figure including both a demand charge and an energy charge for electric power consumption. The operating cost of the diesel unit is \$12.05 per million gallons, a saving of 51.2 percent. Using production figures for 1955, with the diesel pumps contributing 55 percent of the total 668,666,000 gallons, the saving for the year was \$4,645.

The new F-M centrifugal which was installed in 1955 represents a saving of \$3.50 for each million gallons of water discharged by this pump. Averaging 2200 gpm, the old unit needed 2280 hours to supply 45 percent of the total gallonage in 1955. The new pump averages 2600 gpm with the same power supply and required only 1930 hours to pump an equal amount, represent-

ing a saving of more than \$1,000 in electrical charges during the year.

Figures for 1955 show that the cost of operating the new diesel engine was \$4,493. Of this amount \$4,-063 was spent for fuel, \$350 for lubricating oil and \$80 for maintenance. For each million gallons of water pumped by this engine the costs were: \$10.90 for fuel, \$0.94 for lube oil and \$0.21 for maintenance, a total of \$12.05. Superintendent of Public Works, Rudy K. Genthner, does not figure any additional charges for labor, since the installation of the diesels did not require augmentation of the operating staff. The same men who previously operated the station take care of the diesel as well.

Canandaigua Lake, an inexhaustible source of fresh, spring-fed water, supplies both the city, summer population 15,000, and the veteran hospital which has a population of 3,000, equally divided between patients and staff. All water is supplied by the West Lake Road station, pumping through a 12 and 16-in. pipe to the city and hospital or lifting it through a 16-in. pipe to the reservoir. The reservoir, situated 275 feet above the station and three-quarters of a mile away, holds 4,-000,000 gallons and is an excellent active reserve supply.

GOOD REFUSE SANITATION

is not IMPOSSIBLE

G. H. EAGLE
Engineer in Charge,
General Sanitation
and

S. M. OVERMAN
Sanitarian
Ohio Department of Health

IN EVERY COMMUNITY the proper storage, collection and disposal of garbage and refuse is no less an obligation of the responsible officials than is the provision of a safe water supply and an adequate sewerage system. All are necessary for protection of the health of the people.

This is the philosophy of the Ohio Department of Health. It has spread throughout the state. Ohio is becoming more and more "refuse conscious."

State-Wide Survey—Before 1950 there was very little information on the state level concerning garbage and refuse programs by municipalities and other political subdivisions. At that time, due to many complaints, petitions, and requests for information concerning refuse sanitation received by the Ohio Department of Health, a state-wide survey was initiated by its Division of Sanitary Engineering.

There were three principal purposes of this survey: (1) to find out what refuse collection and disposal practices were being followed in Ohio; (2) to offer local municipal and health officials information and available help; (3) to begin a program to impress municipal officials with their responsibility for proper refuse collection and disposal facilities. In all, 121 cities were visited (a city in Ohio is a municipality of over 5,000 population). Some of the highlights of this survey were:

(1) Most cities (85 percent) had ordinances controlling the storage of garbage and refuse on individual premises; but over half of these cities had poor storage conditions.

(2) Complete municipal collection of garbage and refuse was provided by 40 cities (33 percent); 5 percent contracted for complete collection services; 33 percent were dependent on private haulers; the remaining 29 percent had various

combinations of these types of services.

(3) Better storage conditions and better collection services were found in cities having municipal collection of garbage and refuse. For instance, of the 53 cities where premise storage conditions were rated as good or fair, over 80 percent had municipal collection services.

(4) Open dumps and/or garbage hog feeding farms were used by 78 cities (65 percent) to dispose of garbage and refuse; 31 cities (25 percent) were using incinerators; and 12 (10 percent) maintained sanitary landfills.

Since the initial survey, there has been considerable progress by municipalities in Ohio in improving their refuse programs. The files of the Ohio Department of Health may not reflect all the recent progress in refuse sanitation, but of 128 cities on which there is information the following can be reported:

(1) Presently 69 cities have complete municipal collection of garbage and refuse. Thus, 29 cities since the 1950-51 survey have replaced privately operated collection services (or partially privately and partially municipally operated services) with complete municipal services.

The sanitary landfill method of refuse disposal is now used by 61 cities. This is a great increase from the 12 landfills that were in opera-

tion in 1950. The use of incinerators has remained about the same. While several new incinerators have been built, or are under construction, several have been abandoned in favor of sanitary landfills.

There are no municipal reduction or composting operations in use in Ohio although some cities have made preliminary investigations of such operations. One Ohio city has a central garbage grinding plant where garbage is ground and treated with the sewage.

Problems in Refuse

Experience of the Ohio Department of Health indicates that the great majority of cities are able, from a financial standpoint, to solve their refuse handling problems if the necessary time, effort, and planning are applied by responsible officials. There are, however, several problem areas regarding refuse sanitation in Ohio which will require greater effort to solve. These particular problems can be outlined as follows:

(1) **Disposal of Non-Combustible Refuse in Large Cities.**—Cities of over 100,000 population have a major problem of disposing of wastes that cannot be incinerated. Of the 8 cities in Ohio of over 100,000 population, 6 have incinerators for the disposal of combustible wastes. The only satisfactory meth-



● COUNTY, state and municipal officials discuss an exhibit at one of the refuse clinics in Ohio. Approximately 100 public officials have attended each of these clinics, which help the exchange of information on all phases of refuse sanitation.

od of disposing of the non-combustible wastes is by a sanitary landfill. Sufficient land suitable for maintenance of landfills is not readily available to these cities.

(2) *Higher Cost for Municipalities in Congested Areas.*—Medium and small-sized municipalities that are completely surrounded by built-up areas may have difficulty finding suitable land within a reasonable haul distance for a landfill. A municipality so located has to consider either building an incinerator, though its size would not ordinarily warrant such a disposal method, or making a long haul to a landfill in an outlying area. Whatever the choice, it obviously means a higher cost to such a municipality.

(3) *Small Cities and Villages Have Administrative and Economic Problems.*—Nearly all of the small municipalities have difficulty purchasing equipment and land to provide collection services and to operate a sanitary landfill. They usually do not need full-time equipment. Unless an arrangement can be made for part-time use of the equipment on other village operations, or some other means found for reducing the expense, such municipalities will have a considerably higher cost in setting up and operating a refuse system.

(4) *Counties Slow to Act.*—A number of counties in Ohio have large areas of unincorporated developments where much garbage and other refuse are produced. It has been only within recent years that county governments have had adequate authority to set up and operate refuse collection and disposal facilities. Even so, most county governmental bodies are somewhat reluctant to establish such municipal type services except under very compelling circumstances.

Leadership Is Needed

As mentioned above, the great majority of cities in Ohio are able to set up adequate refuse collection and disposal facilities from a financial standpoint. The single greatest problem in many of these cities appears to be the lack of responsible leadership—someone capable of analyzing the needs of the community and making a workable over-all plan to handle the community's refuse. Given this, most cities can work out a satisfactory refuse program.

This problem—the lack of qualified leadership—is most acute in the four areas outlined above where there are particular problems to be solved in setting up an adequate refuse system.

Basically this problem can be summed up as follows: There has been a failure of many public officials to recognize or accept the responsibility that the function of refuse collection and disposal is a major enterprise necessitating the same attention that is given to other

Chief Sanitary Engineer of the Ohio Department of Health, states: "We feel that the officials of every community of any appreciable size must assume full responsibility for the proper storage, collection and disposal of garbage and refuse. It is no less an obligation than providing a safe water supply and an adequate sewerage system. All are basic sanitation services that must be given primary consideration for proper protection of the health of the people."



● **LANDFILL** operation is excellent at Xenia. The site is a gravel pit. Top and sides of pit provide cover material. Municipal collection service is fine.

public services. Particularly apparent in this regard is the failure of public officials to realize the need of engineering or other qualified personnel to direct and supervise the operation of refuse handling facilities. There has also been an almost total lack of approach by public officials to consulting engineering firms for services for planning and operating refuse sanitation programs. Because of this, some consulting engineering firms lack engineers experienced in handling over-all refuse program planning for municipalities and counties.

Ohio's Program

What has Ohio attempted to do to meet this problem? As previously stated, one of the principal purposes of making a statewide survey of refuse sanitation practices in Ohio in 1950-51 was to create among public officials an awareness of their refuse problems and to encourage them to accept their responsibility in making needed improvements. In the reports of the surveys that were sent to Ohio cities, F. H. Waring,

It was Mr. Waring's foresight and the efforts of his division to get public officials to accept their proper responsibilities that led to many improvements in refuse sanitation programs in Ohio during the past several years. The factors outlined above—the lack of professional, high-caliber personnel for planning and directing refuse programs, and the lack of consulting engineering firms experienced in refuse sanitation—could not be remedied unless public officials had an appreciation for the need of such services.

In each of the survey-reports made in the 1950-51 refuse survey there was, in addition to the report of the status of the refuse program, a letter pointing out the responsibility of public officials in such a program with a list of recommendations that should be worked toward in order to have satisfactory refuse handling facilities. From this point, calls were made to municipal and county officials at intervals by the department's sanitary engineering personnel. Many city council and special meetings of municipal and



● CREWS and collection equipment used at Delaware. Clean uniforms are furnished and required to be worn by collection personnel. Disposal is by landfill.



● WORKING in the disposal area at Delaware. Refuse is collected weekly in residential and daily in business areas. Refuse is compacted and covered daily.

county officials were attended to inform these officials of their responsibilities and needs in getting satisfactory refuse collection and disposal operations.

This type of program has continued and in 1955 the Ohio Depart-

ment of Health decided to sponsor several Refuse Clinics over the state for public officials and other interested parties to discuss refuse problems and solutions. The Ohio Municipal League and the Ohio Association of Public Health Sanitari-

ans were enlisted as co-sponsors of these clinics. Four of these clinics were held in 1955 and four have been held in 1956. Approximately 100 public officials attended each clinic. There were discussions on all phases of refuse sanitation and on practical ways of financing refuse programs. The responsibilities of the community and of community officials were emphasized. Discussion by officials from communities with satisfactory programs provided much information and encouragement to those who still have problems. More of these clinics will be held annually.

The progress being made by Ohio communities in their refuse sanitation programs can perhaps best be pointed out by giving a few typical examples that have come to the attention of the Ohio Department of Health.

Delaware — Delaware, population 13,500, formerly had garbage and refuse collection service provided by private haulers. The service was not dependable and less than one-third of the residents maintained regular collection of garbage and refuse. The wastes accumulated in back yards or were dumped on vacant lots. Garbage that was collected was fed to hogs and the other refuse was put on an open dump located inside the city limits. The health department and city council received many complaints concerning poor collection services, smoke, odor and other nuisances.

After urging by the local health department, the city council requested Don Mackley, Director of Public Service and City Engineer, to draw up a program for the municipal collection and disposal of refuse. A comprehensive plan was prepared which provided city-wide collection and sanitary landfill disposal. The plan received almost unanimous support from the civic organizations and from the people of the city generally. It was adopted by city council.

General obligation bonds amounting to \$35,000 were issued to purchase collection equipment and a tractor to operate the landfill. Land was available at the sewage treatment plant site. Service charges are at a level to pay off the bonds and to pay the operating costs of the program. The charge is \$1.00 per month to residential customers for weekly

collection service. Business establishments are charged in proportion to the amount of refuse produced and the frequency of collection. The annual revenue received from service charges is approximately \$58,000 and the expenses of operating the program and paying off the bonds are about \$52,000. Income not needed for operation and debt retirement is used to repair or replace equipment.

The system continues to be under the supervision of the City Engineer who planned the program. No better example could be shown of a city which has developed a complete system of refuse handling from virtually no program at all in the beginning.

Maple Heights—Maple Heights is an example of one of Ohio's cities

penses for operating the refuse facilities are paid out of the general tax fund. Now Maple Heights does not have to worry about having a place to dispose of its refuse. If it were located in one of the less populated counties, it might have been cheaper for the city to dispose of all refuse by a sanitary landfill. But with the shortage of open land in this area, the incinerator was the best solution.

Westerville—The village of Westerville, estimated population 5,000, offers an outstanding example of satisfactory village refuse collection and disposal. Until 1951, Westerville depended on private haulers for most of its garbage and refuse collection service. Within one-half mile of its residential section was located one of the worst dumps in the area. Not

only was it used by the people of Westerville, but garbage and trash haulers brought in refuse from all over the county. The dump was burning most of the time. There was a heavy infestation of rats and flies.

One of the first things the new village manager did, when he came to Westerville in 1951, was to set up a plan to provide adequate refuse collection and disposal service for the village. A packer truck was purchased to provide collection service and a tractor with a bullclam attachment was purchased for operation of a sanitary landfill. Land was obtained adjoining the dump for a landfill and the dump was used for landfill purposes after destroying the rats.

To start this program, the village transferred \$6,000 from a surplus fund of another utility and issued \$10,000 in mortgage revenue bonds. A service charge is made for the collection and disposal service to pay off the bonds and to pay the operating costs of the program. Revenue received from service charges in 1955 was \$23,780. Operating expenses and debt retirement for the same year were \$23,080.

Small Villages and Townships—An example of what villages and townships can do with a garbage and refuse disposal problem is demonstrated in Putnam County, Ohio. In this rural county an association has been formed to operate a sanitary landfill; nine villages and six townships are participating. Each pays to the association a cer-

(Continued on page 148)



● **COME AND GET IT:** A load of garbage is dumped into the hog feeding area.

that is solving its refuse disposal problem by constructing an incinerator. This city is located in heavily populated Cuyahoga County where little land is available for maintaining open dumps or sanitary landfills. During the past several years the city's wastes have been hauled to an incinerator in another city and to privately operated open dumps and landfills. None of these arrangements was entirely satisfactory and the city had no assurance as to how long any of them would last. The mayor and city council did not want a situation to develop overnight whereby the city would have no place to dispose of its refuse. A plan was drawn up to construct an incinerator for the combustible wastes, with disposal of non-combustible refuse in a sanitary landfill. General obligation bonds for \$175,000 were issued to finance the building of the 150-ton capacity incinerator.

The city purchased four 16-yd. packer trucks and is providing excellent collection service. The ex-



● **HARD FACT:** Unless a satisfactory place of disposal is provided, signs like this are apt to encourage dumping. This dump has now been replaced by a sanitary fill.

MICROFILMING CUTS COSTS

in ENGINEER'S OFFICE

IF THE Engineer's office had to pay \$1 a page for copies of all deeds in Watertown, N. Y., the cost would have been prohibitive. Deeds average 750 pages a year, and if each deed required 2 copies, the figure could come to \$1500 a year. Before microfilming was installed, the deeds were transcribed by hand, or briefed. That meant 3 or 4 "briefs" could be obtained per page of the bound volumes used in the Assessor's and Engineer's offices for public reference. Photostat copies were not made from bound volumes because about three times as many pages would be required as for hand-transcribed copies. The reason is that the photostat method reproduced every page of the deed. Not only was this too expensive, but it meant faster shrinking vault space. More books would have been required, and at \$80 a book, this would have added even more to the upkeep of records.

The cost of the hand transcribing method, formerly used, included \$500 a year for the part-time pay of a County Clerk Stenographer, plus the \$80 for the bound book. There was a book in the Assessor's office and one in the Engineer's office. Bound books of property maps are still available in these two offices for reference by the public.

Under the microfilming system, a member of the staff from the Assessor's office visits the County Clerk's office and brings her microfilming record up to date. While the pages of the volumes in the county office are larger than 8½ by 14, the actual image of the deed page is held at the legal size, which is within the photographic field limits of the Recordak Junior. A Recordak automatic counter was attached to the Junior to permit numbering of the deeds in sequence each year, providing the Assessor's office with a numerical count for indexing and checking purposes.

When the film is processed, a positive print is also ordered for use in the Engineer's drafting room where an auxiliary film reader has been installed for convenience. From the film, one of the Engineer's staff transfers the information of boundary changes to reference cards. A small sketch of the area in question is already on each reference card. Copy sketches of the changed boundaries are then made on a 20-ft. to 1-in. scale. These are patched

ence volume of owners is made every year. Changes in this volume are made throughout the year to keep an up-to-date reference for public use and also to serve as an index for the film records. Each year the film references are spliced into a single roll.

The use of microfilming enables the Assessor's office to keep more up to date, assuring prompt billing. When the time comes to mail tax bills in July all the names of property owners have been changed except those occurring in the last few days of June, and these are obtained the first working day in July.

The reduction in the cost of record keeping has resulted in enough savings to pay the cost of microfilming in the first year. The need of seeking more vault space to augment present vault area now bulging at the seams is no longer necessary. Add to this the ease and simplicity of looking up properties on the film reader instead of digging out old volumes from the vaults.

Microfilming of all maps has been considered for protection of duplicate film roll off the premises. It is intended to microfilm eventually all old bound volumes for protection against disaster and perhaps, also, to store an original negative or positive print out of town.

This plan was inaugurated in Watertown on July 1, 1954, and before microfilming started there were 20 bound volumes. The February, 1956 issue of Public Works contains general information on how this system was started and on the installation of the equipment.



● SPACE a problem? The roll contains the data from the volumes shown.

onto the original tracings of section maps. Copies on a 50-ft. to 1-in. scale are also made using Ozalid for the standard-size pages which are placed in the bound reference volumes. Pages are supplied for two bound volumes, one in the Assessor's office and one for the Engineer's office.

In the Assessor's office, the information from the film is transferred to a card file for handy reference. Addressograph plates are made immediately of new owners of property and from these plates a refer-

● RECORDAK filmreader is used in Engineer's drafting room. Changes in property lines are noted by checking latest deeds and alterations are made in master maps.



MONEY MAKES WATER A PROBLEM

ALL OF US are probably ready to admit that homes can be built faster than water supplies. Gone is the period when expanded systems added new customers and surplus revenue poured in. By now most of us have faced the day when new sources of supply and major transmission systems must be built and paid for. To add to these woes, our forefathers never dreamed this could occur so the original systems were not designed for the expansion which has occurred, and the strengthening must go back through old areas which are cluttered with utility lines of all types.

Now undoubtedly these new customers will ultimately pay off—but like the poor man who can't afford the cash bargain, the problem is how to get the money to support the tremendous investment which

HENRY J. GRAESER

Superintendent

Dallas City Water Works,

Dallas, Texas

is needed immediately. If we could control the rate of development we could keep it in line with our ability to pay. Unfortunately, we must accept the course of events and rebuild the system to meet the new demand plus a little future capacity so that our successors will not be faced with the same problem.

Most cities considered the boom too good to last and adopted very liberal policies in participating with subdivision developers whereby a large portion of the cost of area systems was repaid by the City to encourage prosperity. In recent

times, however, the swing has been to a financial policy which requires developers to pay total cost of the utilities which serve their immediate area and the cities have found their hands full with the problems of off-site transmission lines, plants and supplies. After the end of World War II, Dallas followed a financial policy of participation with the developers to the extent of about 55 percent of the cost of the system in the immediate development. In addition to this expense, the City undertook to finance the cost of expansion of plant facilities and construction of a major network of transmission lines needed to supply a city of about 800,000. It was soon obvious, in spite of rate increases, that this financial policy would be ruinous. Too, it was equally obvious that it was unfair

Table I—Capital Costs Incurred for 87,000 New Water Connections, 1945 - Aug. 1955

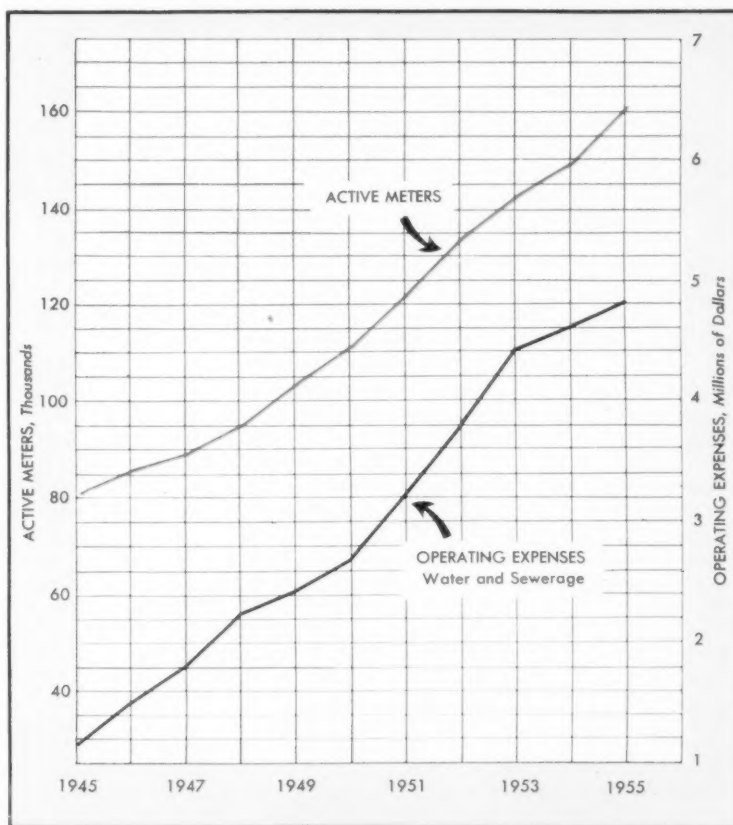
<u>Water</u>		<u>Cost Per Connection</u>	<u>Off-Site Costs</u>	<u>Area Costs</u>
Administrative Office, Shops & Unclassified Capital	\$ 338,172	\$ 3.89	\$ 3.89	
Supply (Wells & Reservoirs)	6,978,194	80.21	80.21	
Purification	5,685,318	65.35	65.35	
Pumping	1,669,409	19.19	19.19	
Sub-Total		168.64		
Distribution				
Mains (to 24")	\$23,888,029	274.57		\$274.57
Mains (24" & Over)	6,820,550	78.40	78.40	
Meters	1,825,035	20.98		20.98
Services	1,716,897	19.73		19.73
Sub-Total	\$34,250,511	393.68		
All other (Elev. Storage, Land & Equipment)	2,108,345	24.23	24.23	
	\$51,029,949	\$586.55	\$271.27	\$315.28
<u>Sewerage</u>				
Sanitary Sewers				
Interceptors	\$10,770,187	\$123.80	\$123.80	\$220.33
Area Sewers	19,169,055	220.33		
All Other Lands, Bldgs., & Equipment	164,316	1.89	1.89	
Sub-Total	\$30,103,558	346.02		
Sewage Treatment	3,171,124	36.45	36.45	
Sewage Pumping	836,431	9.60	9.60	
Unclassified Lands, Mach., Etc.	291,310	3.35		3.35
	\$34,402,423	\$395.42	\$171.74	\$223.68

to the citizen who had lived in Dallas for many years to receive additional rate increase for the support of systems serving new homes and industries appearing in Dallas at the rate of about 8,000 to 10,000 per year. So, in 1954, the City Council adopted a policy whereby developers would pay the total cost of their water systems and sewer systems, the City sharing only in the cost of incremental or oversized lines above a minimum of 8 inches in size. It was considered equitable that the new homeowner pay in his mortgage the price of the system required to serve him immediately, and that the City apply the income from his new account, over and above operating expenses, to the cost of additional plant and transmission facilities. Developers as a whole saw the necessity for this plan. Surrounding cities also reached the point where a similar policy was necessary, so no unfair competitive factors were introduced to home builders in the area. In the absence of outside city development, where standards could be reduced or refunds received, there was little difficulty in obtaining the full cooperation and support of home builders for this needed approach to the problem. Admittedly, Dallas County is in an extremely fortunate position for outside city development. Ground water is anywhere from 1200 to 3000 feet deep, the more shallow sources being in limited quantity. After a few unsuccessful attempts to develop "independent" systems, developers came to cities with available sources of water supply and sewerage facilities. While this brings the water development squarely home to the cities, it does have an important bearing on orderly development of a county area.

It may be of interest to you, however, to review the cost experience typical on subdivision developments in Dallas in recent years. Keep in mind that these costs represent a basic water system which has as a minimum size a 6-in. water main. Alternate streets generally have an 8-in. line and not more than one fire hydrant is placed on an unsupported length of 6-in. line. The sanitary sewer system has as a minimum size 8" sewer employing for the most part concrete pipe. Of ten typical small subdivisions, each having about 50 lots constructed in 1954, we found an average overall cost per lot of \$233.26 for water and \$181.83 for sewerage, for a total cost of \$415.00. We then took an-

other group of ten subdivisions with an average lot frontage of 79.3 ft., with 147 lots per addition and found the average cost for water was \$206.90 per lot and for sewer \$149.37. The total cost per lot for

\$271.27. The area or on-site costs for sewerage have averaged \$323.08 per new connection while off-site costs such as major interceptors and treatment facilities, \$171.74. It is to be noted that all of these figures



● FIGURE 1, showing Dallas' experience with operating expense and metered users.

both utilities was \$356.27. For 22 subdivisions constructed between 1950 and 1955, over the years the costs have averaged \$174.77 per lot for water and \$136.31 for sewer, or a total average cost for both utilities of \$311.08. This can be compared with the over-all experience in Dallas for capital expenditures since 1945. Table I includes all capital outlay, including motor vehicles and other equipment, but, of course, the preponderance of costs lies in new plants, systems, new reservoirs, etc. Thus, for the 87,000 new connections gained since 1945, the total cost per new connection for water has been \$586.55 and for sewerage \$395.42. Considering the total capital cost for water facilities only and dividing these costs between what might be termed on-site and off-site facilities, area or on-site costs come to \$315.28 per new connection, and the off-site costs, such as plants and sources of supply, amounted to

reflect the total capital value of the system and do not give consideration to pro rata charges or total cost installations made by developers which have reduced the total investment made from city bond funds. These are pointed out simply to illustrate the off-site cost resulting from new customers. This is a point which many cities omit in their calculations of financing and become financially burdened when the time comes to back up new customers with new plant and supply facilities. For most of us, the day is past when we can offer inducements to industry in the form of low water rates or participation in the cost of utility systems to developers. No doubt, when our population growth levels off, income will exceed requirements for debt and operating expenses, but it is better to face the future prospect of reducing rates to the customer than it is to reach a financial con-

dition where rates are exorbitant to citizens of this day. It must appear to many real estate developers that municipal water departments are "cleaning up" on a financial scheme whereby the utility gets a large portion of its capital structure free. The factor overlooked, however, is the necessity for an investment off-site and in incremental sizes of mains which is equal or exceeds the cost per lot for minimum-sized mains in new subdivisions.

Not to be overlooked in the financial scheme of water departments is that an increase in the number of customers means an approximately parallel increase in operating expenses. Fig. 1 shows Dallas' experience with operating expense, debt payments, and increasing income. These figures are projected for the years 1955-56 through 57-58. The difference between income and expense, of course, appears to be profit but actually represents funds available for cash outlay for such items as meters, services, automotive and construction equipment, etc. and is all put into capital outlay accounts. As you can see from the graph, there have been years when very little additional income was available for these requirements, and also there have been years where hot summers and water sales exceeded estimates and the cash reserve grew.

Figures, of course, can be misleading (each city is a law unto itself depending upon availability of supply) but they are indicative of the expense involved in growth. If anything, they are too conservative, considering the fact that many cities have reached a point where they go 40 to 100 miles or more for adequate sources of supply. The Associated Press recently reported that "some dreamy eyed Californians have suggested towing icebergs up from the Antarctic to bolster California's water supplies." This same report stated that a survey of the nation indicated one city out of seven had employed use-restrictions at some time. Southern California is talking about aqueducts from northern California; Denver, Colorado is planning a 23-mile tunnel through the Rockies costing \$43.6 million. Dallas was reported to be planning a \$20 million lake 40 miles away. They forgot to mention the transmission line and purification plant which will add another \$40 million to that expense. I expect the boom cost to now will be conservative compared to the next leg of the journey.

If there can be any moral to this story, it should serve to alert all of us to the fact that area extensions to serve new customers will surely bring manifold problems of plant and supply expansion beyond our past experience. Thus, in our scheme of financing we should be most careful to see that income available from new customers is sufficient to carry both the cost of the area development and the off-site expense which will result. In administration of city bond fund programs, there is always the problem of political area considerations, neglecting the fact that we are operating a utility and not a political subdivision. Thus, in scheduling our expenses we should assure ourselves that the investment which we are making with bond funds will obtain sufficient revenue to carry the debt service on these investments, and we should spend these funds only as they will pay their way. In Dallas the average water customer returns a gross on water and sewer service of approximately \$57.50 per year. Since these two utilities are under common management and supported by a combined rate we consider financing them as a package. Past experience has shown we have 57.8 percent of gross income available for capital. Off-site development expenditures have run approximately 43 percent of our total capital expenditures. Thus, if we set aside from the average annual water bill \$33.22 (57.8 percent of \$57.50) for capital, and reserve 43 percent of this amount for plants and supply, \$18.94 per year per connection is available for immediate-area water and sewerage costs. So, in aid of the subdivision developer where over-size mains are involved, or lead lines and trunk mains must be built, it is economically feasible to spend up to \$308.00 per new connection for both water and sewer facilities. The basic system within the subdivision must be built at total cost by the developer regardless of whether any off-site or incremental size costs are involved. The \$308.00 represents the capital on which \$20.00 annually will service the debt for 20 years at 3%. This is a conservative approach to the question of financing water and sewer extensions, yet we note that our investment since the end of World War II has given us a system capable of supporting only the present population until about 1965, and by then additional reservoirs, filtration plants and major transmission lines must be built. Thus,

the figures which we have given previously pretty well indicate the ultimate cost of the growth which has been experienced to this date, and provide a reasonable index of just what expansion means in terms of money.

The money must come from sale of service, so, basically, our approach to money involves a well-planned and realistic schedule of rates. K. F. Hoeftle, former Water Superintendent of Dallas, once made the pertinent remark that "far too many municipalities set their water and sewer rates by political expediency rather than sound rate making principles." When you stop to think of it, it is unusual that we are running the only utility where our raw material falls from the sky free, sometimes at too frequent intervals, and at others all too infrequent. The income varies depending entirely upon the grace of the elements. Yet, our customers are accustomed to the idea of water as rain, pure and unmineralized, free of charge. The result is a rather firmly entrenched feeling that water should be "dirt cheap", and the factor of sustained supply depreciated.

It is an ill wind that blows no good though, and the recent drouth with its emergencies and critical periods of supply has served to a large extent to publicize the cost of obtaining water in our semi-arid Southwestern area.

The Wall Street Journal, Associated Press and other sources of public information, have repeatedly carried articles on the problem of finding and on the cost of developing new and adequate sources of supply. It has been rough sledding for those of us on the "firing line", but publicity of this type will help us in future years to sell programs for water development coupled with an adequate rate for support of our utilities. The relative importance of the water supply to the community has grown in this past period. As an Associated Press article reported, "We've suddenly discovered water is the lifeblood of our economy." The problems of transmission are appreciated more now than ever before. All of these things have helped to ease our job of finding the money—which makes water supply a problem.

Yes, "water, water everywhere", but getting men capable of planning the job to be done, finding the money to build it right, and then seeing that it arrives everywhere, rain or shine, are what makes it a problem.

Special Equipment

IN A COUNTY HIGHWAY DEPARTMENT

NORTH H. NEWTON, Champaign County Engineer, Urbana, Ohio

THIS IS the age of specialization, for without specialization to some degree, any construction organization is lost. The price of labor requires that you use machinery wherever it is possible to do so. Some of this machinery will probably be of a special type that fits your particular conditions.

In our highway and bridge work, we have found a great many instances where lifting or hoisting equipment was necessary. These jobs are comparatively small and light but too heavy to be performed by manual labor though not large or heavy enough to demand our half-yard crane. We did not have any equipment specially adapted to this type of work; as a result a multitude of smaller jobs piled up.

We felt some solution could be worked out, but we did not want to invest the amount of money required to purchase another crane. A couple of years ago we purchased a used FWD truck and mounted a pipe

boom on the rear part of the flat bed. This truck worked quite satisfactorily, however, it soon developed that it had some undesirable features. In order to swing a load the entire truck had to be moved which sometimes presented difficulties, and took considerable time.

Continually searching for something better we considered several possible solutions. None of these was just what we wanted, but last summer we observed a Pitman Hydralift working on a building project. Further investigation of this equipment convinced us that this was about what we were looking for.

Our department believed that this crane should be mounted on a FWD truck, because this equipment was to be used both on and off highway pavements. A 4-wheel drive truck can be used under more unfavorable conditions than a conventional truck. Therefore, we purchased a 1955 FWD Model 172 chassis truck at a cost of \$6,741. This truck has a 166-inch wheelbase, and is equipped

with a 50 gallon gasoline tank, auxiliary transmission, power steering, power divider, 12-volt electrical system and hydraulic brakes. The auxiliary transmission gives 10 speeds forward and 2 speeds in reverse. The power divider allows the operator to apply one-third of the power to the front axle and two-thirds of the power to the rear axle if it is required.

The Pitman Hydralift, Model 60, is equipped with a 17-foot boom that can be extended to 22 feet or 27 feet; inside controls and outside controls; two hydraulic operated outriggers; and 100 feet of one-half inch wire cable. The Hydralift is mounted directly behind the truck cab. It was purchased for \$4075.

The boom swings through 180 degrees and is controlled by hydraulic cylinders. The elevation of the boom is controlled by another hydraulic cylinder. The load cable is worked by a winch and the hydraulic pump and the winch are operated by power-take-offs from the truck engine. With the boom lowered to truck bed height, the winch can be used as a



● **HYDRALIFT** close-up. Operator has good view of all his operations. Truck coloring is two-tone, white and orange.



● **TRUCK** with snow plow hitch in front, headlights on cab for snow plowing. Arm holding turn signal in front of crane.



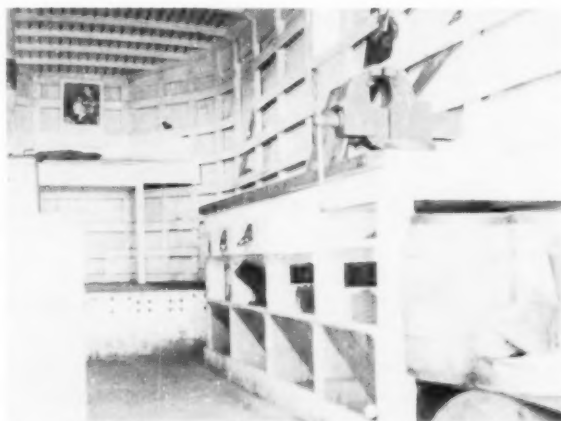
● REAR view of semi-trailer; the front is shown at right.



● SEMI-TRAILER: shanty, shelter, tool rom and workshop.



● "SAFETY is our Business"—the new sign truck. With attractive slogans and painting, it is good public relations.



● INSIDE of trailer shown above. Provided are: Table for checking plans; drawers and bins for nails, bolts and tools.

conventional winch for a straight pull from any position within the 180 degree swing area. The lifting capacity varies with the length and angle of the boom, but maximum capacity is 4 to 5 tons up close to the truck.

We had a special heavy duty 12-foot flat bed built on this truck. As a part of this job we had one pair of body jacks installed under the rear corners of the bed, one universal sheave block with floor socket in the rear center of the bed, and three special tool boxes—two small ones on the left side and a long one on the right side.

The universal sheave block fits in a socket at the rear of the bed. With the sheave in a horizontal plane, the winch can be used to pull from either the right side or left side of the centerline of the truck.

The truck bed was built by the Schodorf Truck Body & Equipment Co., Columbus, Ohio. It is a real heavy duty bed built especially for this truck. The same firm built the

tool boxes and installed the sheave block with floor socket and the body jacks. The total cost of this equipment was \$690.

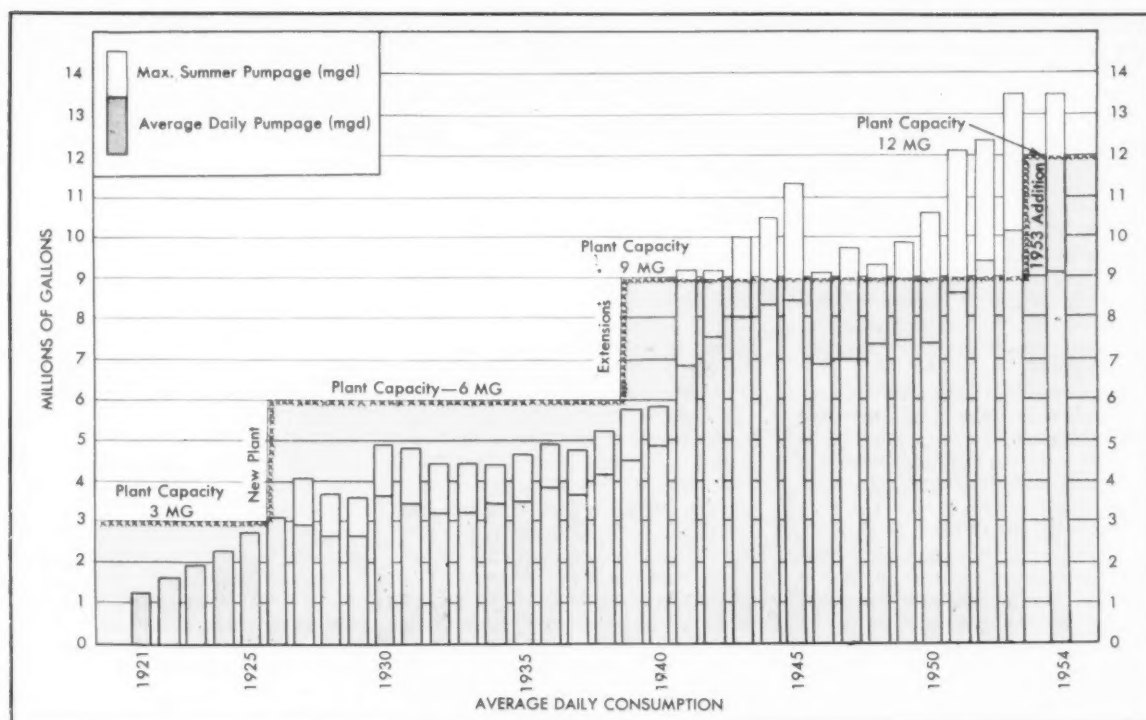
In addition, we had a snow plow hitch mounted on the front of the frame which enables us to mount either a one-way plow or a V-plow. To lift the snow plow we mounted an electrically driven hydraulic pump inside the truck cab. The snow plow hitch cost \$460 and the pump cost \$162.83.

A 12-volt 100-ampere capacity Leece-Neville alternator costing \$216.19, was installed to take care of the electrical load. A special transformer was installed to allow 110-volt AC current to be taken from the alternator. This alternator will generate enough 110-volt AC current to run a one-half inch drill or a couple of small flood lights. The alternators have a high charging rate at low engine speeds and this keeps the battery well charged at all times.

The alternator, the electric pump,

the turn signal lights, and the mud flaps were installed in our own garage. The other equipment was installed by the suppliers. This truck and equipment cost a total of \$12,345.02. We did not keep an accurate account of our work on this truck, however, it would be safe to say that the overall cost was about \$12,500. This may sound high at first thought, but we have a universal piece of equipment. It can plow snow, do crane work, load and haul materials, and load and haul some equipment. For what this truck will do it is not as expensive as some single purpose pieces of equipment. The power steering on this truck makes it easy to drive and maneuver and it is the easiest operating snow plow that we have. It is used frequently to load and haul logs and stumps that have been cut from trees along the roadside. Large culvert pipe can be loaded onto our low bed trailer and the pipe unloaded and placed at the culvert site by our larger crane.

(Continued on page 150)



CITY WATER SYSTEM

Expands to Serve County

A NEW CONCEPT of water distribution in Spartanburg, South Carolina, that of a county-wide water system, has placed the Spartanburg Water Works at the head of a \$7 million expansion program. Originally established to serve the City of Spartanburg, the Water Works has consistently followed a policy through the years of aiding suburban areas where feasible. Consequently, the Public Works Commission which administers the Water Works is prepared to meet the challenge of providing water for the entire rapidly developing county.

The need for expanded water facilities has been hastened by a number of factors, including rapidly increased industrialization. One company alone, now constructing a five million dollar plant estimates its initial need for water will exceed a quarter of a million gallons per day. Extending water lines into the county will also mean the opening of new territory for industry,

R. B. SIMMS

Superintendent,

Spartanburg Water Works
Spartanburg, South Carolina

and so increasing the need for more water. Migration of city residents to nearby suburbs has created a need for larger water lines in these outlying areas. Spartans are using more water, averaging 159 gallons per capita per day normally and 230 gallons in summer.

Rainfall in the county has been below average for the past six years. Summer drouths have seriously hampered the water systems of smaller communities in the county. And this, in turn, has created a desire by residents in these communities to seek water from Spartanburg rather than count on the community systems. This reputation of dependability was built up over a period of years by the Public Works Commission which had the fore-

sight to anticipate the needs of the county as well as the city.

Prior expansion projects have already brought the system up from a 3 million gallon daily capacity in 1925 to a 12 million gallon capacity in 1956. The commission has given the nod to an additional \$45,000 expansion project which will raise the limit to 15 million gallons by February of 1957. Last year, the average daily pumpage rate was 9,069,100 gallons, well below normal operating levels.

The largest single project undertaken is construction of a 9 billion gallon reservoir which will cost \$2 million and will provide the system with ample raw water storage for some time to come. Last year, about 3.6 billion gallons of water were used in the county. Further, engineers estimate that the reservoir will re-fill itself completely two and one-half times each year of average rainfall.

The lake, set for completion in 1958, will cover 2000 acres and will

be open to the public for boating and fishing. An additional 500-acre buffer zone has been purchased to protect the reservoir and to protect adjoining farm land from flood damage.

These facilities will be added to those of the present reservoir which now has a capacity of 300 million gallons. The addition of five-foot tainter gates on this dam just recently installed has increased capacity by fifty percent and will assure adequate raw water storage for the county until the new reservoir is completed.

The means by which a county water system is being built involved the creation of 7 water districts in the last two years. These were set up by acts of the State Legislature at the request of the people in each district. In all cases, the people have elected to purchase their water from the Spartanburg Water Works rather than create their own processing facilities.

Working in close cooperation with each district, the City Water Board agreed to sell water wholesale and act as advisor in consolidating the individual operations of the districts into a well-knit county system.

Each district is responsible for construction and maintenance of its own water lines and allied facilities. The voters in each district voluntarily, through referendums, agreed to pay for construction of lines by issuing bonds backed by their own real estate. These districts are spread over most of the county and there are additional districts now in the formation stage. Only one district voted against issuing bonds for water purposes.

The responsibility of the water works ends when it delivers city water to the district line. The district then takes over the job of metering, selling and collecting for the water used.

A Commission appointed by the Governor directs the affairs of each district. The first of these areas, Inman-Campobello, has already been completed at a cost of one million dollars, an expense which the area property owners gladly assumed by an overwhelming vote of confidence in the bond referendum. The wisdom of building this district system has already been proven by the increased interest shown in that area by industry. One major factory and several minor ones have been built there pointing up the need for more water.

Other districts are in various stages of progress. The total estimated cost of water line expansion

amounts to \$4½ million. All of this money will be raised by issuing general obligation bonds which will be repaid by the families affected.

A second area of line expansion is being experienced in the suburbs of the City. Spartanburg has recently annexed several thickly populated residential areas where water lines are of insufficient size to care for residential needs as well as fire loads and future development. The Board, in cooperation with the City's annexation program, has agreed to provide standard fire protection in these areas as they are annexed. Each area has been surveyed to determine its needs, and larger water lines are being installed as each area is annexed. The cost of these projects will amount to \$1 million. Only one main extension to the City's water lines is needed to provide more water for the City proper. The Water Board has decided to extend a 30-inch line into the City to bolster water pressure there as the use increases. This will complete a project begun in 1954 which brought the million-dollar water line within three miles of the city and made a 20-inch by-pass to the distribution system. Already in existence before this line was built was one 27.56-inch line and one 24-inch line which transferred water 12 miles from the filter plant to the City.

The entire \$7 million expansion program will be financed by issuance of two classes of general obligation bonds. Funds for construction of the new reservoir, filtration facilities, extension of the 30-inch line into the City and re-working of the annexed areas, will be provided by issuance of general obligation bonds which will be repaid directly from income.

The Water Works has acquired and maintained an Aa revenue bond rating which will make this issue

easy to sell at a savings in interest.

In the seven areas where water districts have been established for water line extensions, the districts themselves will issue general obligation bonds. Repayment of these bonds will be made from revenues received by the districts for retail water sales and will be supplemented by a special tax levy on real property in each district. Metering of water in the county, construction of storage facilities for peak-hour and fire use, construction and operation of booster stations in the county will be done by the individual districts.

The Federal Highway Act of 1956 has had its effect in determining expansion of the county water system too. That act allocates \$46.3 million to Spartanburg County for major road construction, \$13.4 million for the first year. The State Highway Department has already designated a fifth major highway for construction in the near future at Spartanburg. As these six-lane roads are built and others modernized in this area, the Water Works will be called on to relocate and modernize its lines. The greater capacity and importance of these highways will naturally lead to the greater need for water. The City Water Board has already begun planning of lines to supply the needs of residential, business and industrial patrons who will utilize building sites along the new roads and in adjacent areas.

Thus, the snowballing effect of rapid industrial expansion and growing population causes a continuing expansion program in Spartanburg County. And Spartanburg Water Works, begun as a system for supplying the needs of a small textile and agricultural community, has now become the sole source of water for a large metropolitan industrial area.

Analysis Determines Costs of Inspections Required in Connection with Building Permits

A cost analysis was made by St. Clair Shores, Mich., of the services performed in making inspections and in issuing building permits. The city's municipal building permit license schedule was questioned in court but a suit brought by a Detroit builder, who claimed that charges made by the city were excessive and unreasonable was dismissed. The cost analysis showed a composite cost per hour for services performed in making inspections

and in other work connected with the issuance of building permits. A calculation of the time involved to make these inspections was estimated for three classes of buildings, and the estimated time of city officials and employees devoted to this function was ascertained. Direct labor costs and an estimated assignment of overhead were then applied to determine the cost of making plumbing, electrical, sewer, and other inspections involved.

MONUMENTS PAY OFF

LAWRENCE F. WAGNER

Ocean County Engineer

Tom's River, N. J.

On County Road Right of WAY LINES

MORE THAN 25 years ago the Ocean County, N. J., Engineering Department initiated a program of monumenting the right-of-way lines of County Roads. Work progressed as the surveying party had time to work on the project. During the depression, the line of some 100 miles of road was established and monumented. When a road is monumented local surveyors are able to use the monuments as a base line for private surveys. After World War II when many developments were started along the County Roads we had no trouble giving the owners information pertaining to the line and width of a road and its established location.

Monuments were placed on one side of each road at the points of curvature, on the tops of hills and approximately every 1,000 feet along the road. Through experience we have found that it is advantage-

ous to place monuments on both sides of the road. The location of the monuments are indicated on the right-of-way map of each road as drawn to a scale of 200 ft. to 1 in. This map can also be used to show the profile of the road and the monuments can also be used for bench marks.

The monuments are cast of concrete by the County Road Department during winter months. The Department has a set of forms and are able to cast 10 monuments at a time. The forms are vertical and it requires about 1 bag of cement for 5 monuments. Two men can make 10 monuments in 2 hours at a cost of approximately \$1.50 each. Monuments are 30 inches long tapered from 7 inches square at the bottom to 5 inches square at the top. The top edges are beveled. There is a $\frac{3}{8}$ -inch diameter reinforcing rod in the cen-

ter of the monument and an indented cross in the top. A four-man survey party can set about 20 monuments a day at a cost of approximately \$4.00 each after the line and stationing of the road is established.

In rural areas, after the monuments are set, a 3 in. x 3 in. x 7 ft. witness post is placed 2 or 3 feet from the monument. This protects the monument from being hit with the mowing machine and also enables one to find a monument, even years later after it may become covered with earth or vegetation. The posts must be anchored with a cross member to prevent easy removal by vandals.

Only about 16 percent of our 620 mile road system is monumented; however, when time permits we will continue to work on the program because in the long run it pays off.



● COUNTY Engineer Lawrence F. Wagner shows here how he locates a monument by reference to the witness post.



● MONUMENTS are of concrete, cast during winter months. They are 30 ins. long and have a reinforcing rod in center.

RATIONAL DESIGN OF LARGE

ROBERT J. FLETCHER

Engineering Department

Sunnyvale, California

THIS IS AN ATTEMPT to show why the standard methods of sewer design are not strictly applicable to certain cases. Features peculiar to the standard methods are first analyzed, including some which are not always discussed in texts covering the subject; then are brought out those features of the special cases which call for other than standard treatment; and finally some suggestions for a rational method of solution are made.

In essence each length of sewer is made large enough to carry, due to its slope alone, flowing full or half full, or at some in-between level, that quantity which is estimated to present itself at the upstream end once in a certain number of years; usually anywhere from one to one hundred; more often five or ten. There are two main

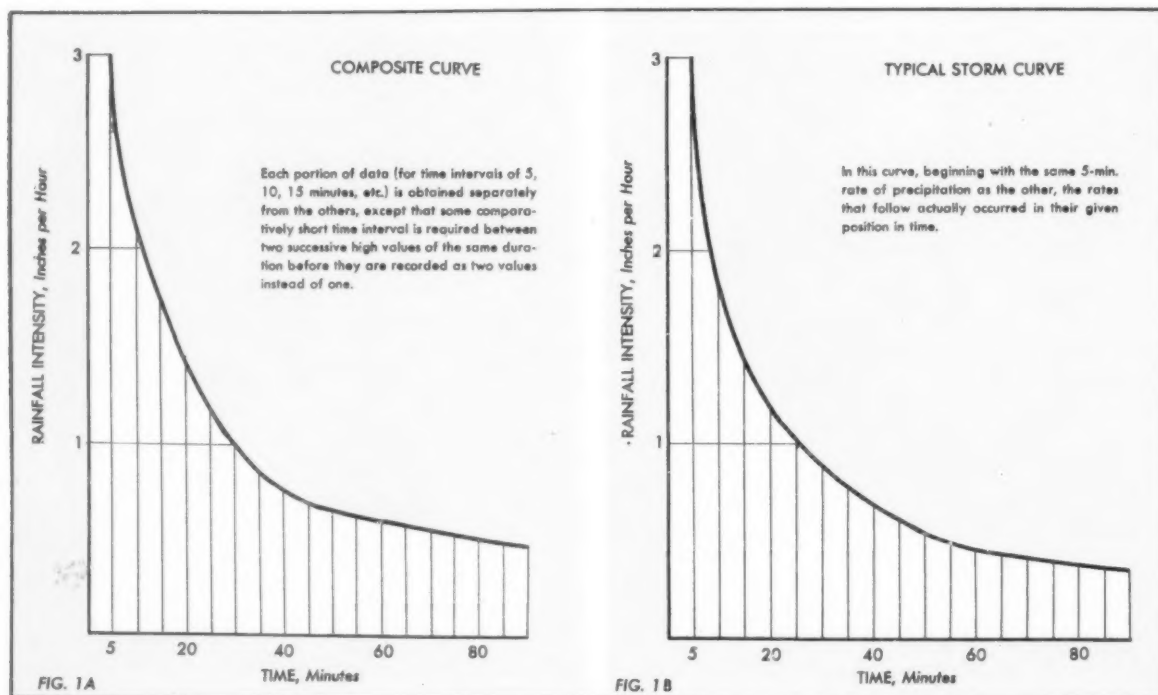
ways in which the quantity is estimated. In general, sewers are at a normal depth with from four to fifteen feet of cover, and slopes are such that velocities are kept within normal limits, usually from two to seven feet per second. This standard method of design is quite satisfactory for most new sewers; additional refinements in method are not warranted because of the uncertainty attached to several of the factors involved, not to mention the added expense of more extensive study and computations.

After several years spent in redesign study of existing old very large cross-connected trunk sewers requiring supplementation, the writer has appreciated that there are applications wherein use of the standard method is not rational, and may suggest the use of larger sizes than are actually required in order to get approximately the safety factor usually obtained. The additional cost may be much more significant where a supplement to an existing large sewer is needed than for a new smaller sewer.

The Rainfall Curve

Much of the rainfall data available is in the form of clock-hour rainfall amounts. By itself, such data are not sufficiently useful for storm sewer design and the modern trend, especially in the larger cities, is to use recording gages. From these the rate of rainfall for any five-minute, or even smaller period, can usually be read. For the City Engineer in a location too small to have maintained adequate records for a sufficient number of years, so that the intensity and frequency of future storms can be sufficiently well estimated, considerable data can be found in published form. An example is U. S. Department of Commerce Weather Bureau Technical Paper No. 24, "Rainfall Intensities for Local Drainage Design in the United States for Durations of 5 to 240 Minutes and 2, 5, and 10-Year Return Periods. Part 1: West of the 115th Meridian."

A curve similar to the "Composite Curve" of Fig. 1 is used in the usual design. It should be based



● RAINFALL INTENSITY curves used for storm sewer design. Curve for a typical storm differs somewhat from composite curve.

INTERCONNECTED STORM SEWERS

on such a number of years of adequately precise record that the experience of the past is a sufficiently probable indication of the rainfall to be expected in the future. Usually the curve is but one of several. For each, the rate of rainfall intensity, in inches per hour, is plotted against the duration of storm in minutes, from 5 to 90 minutes in the curve shown. Each curve shows the relationship to be expected or which is most probable once in a certain number of years: 1, 5, 10, 100, etc.

Assume the curve shown to be a five year one. Then a beginner in this work might think that once in five years there is likely to be a storm that follows the curve; that after thirty minutes the amount that has fallen in inches is just half the figure in inches per hour shown by the curve; and that in sixty minutes the curve shows the amount that has fallen since the start of the storm. This is a false concept. The curve because of the method of its construction is not that of any one storm, but is a composite, a collection of data. Although comparatively easy to plot the curve of any storm from modern recording gage records, there may never have been a storm which, from its beginning, followed the composite curve so that the average rate of rainfall at any time since the start is shown by the curve. Whether the concept is false or not makes no difference because in the ordinary design each length of a sewer is simply made large enough to pass, when flowing at a stipulated depth, the quantity that probably reaches that length once in a certain number of years. Whether consecutive lengths of a sewer pass their respective design quantities within seconds of one another or years apart makes no difference.

Computation of Quantity

The quantity of flow for which each length of sewer is designed is obtained by a standardized method of use of the rainfall curve. This is treated in many texts. Most authorities advocate obtaining the total travel time to the upstream end of the sewer to be designed. The

flow in cubic feet per second is closely equal to the product of the net contributory acres by the curve inches per hour corresponding to the travel time to the upper end, which is the time of duration in minutes. What is actually done therefore is some computation of the time it takes from the beginning of the storm (which is taken as the time of beginning of the maximum five minute rate of precipitation) for rainfall from all of the contributing watershed to reach the upper end of the sewer to be designed, and then the assumption that the rate delivered to the sewer from over all this area is the rate corresponding to that time from the curve.

An alternate method used by a minority is to add to the quantity used for the design of the sewer length just upstream, the quantity obtained by multiplying the rate corresponding to the time of concentration at the head end of the sewer length to be designed by the additional net area contributing. The latter method, of course, always gives a greater quantity when all the other factors are unchanged, because the upstream area is always assumed to have a larger rainfall intensity. This latter method seems to have inherent in it an assumption of the continuity of time (more about which comes later) that the first method does not.

If we use a formula such as Manning's or Kutter's for the solution of the quantity a sewer can carry on a given slope, what we are really determining is the equilibrium quantity that the sewer can carry. That is to say, finally, regardless of upstream and downstream conditions, if the sewer were long enough, the flow that could be supported in the middle lengths by the fall of the pipe per unit of length would be the formula or equilibrium amount. The formula tells us nothing of how the sewage ever gets the energy to go that speed and enter the length in the first place, or how it leaves the sewer. Fortunately for most new sewers, especially in the smaller sizes, the normal depth of cover in the ground is sufficient to

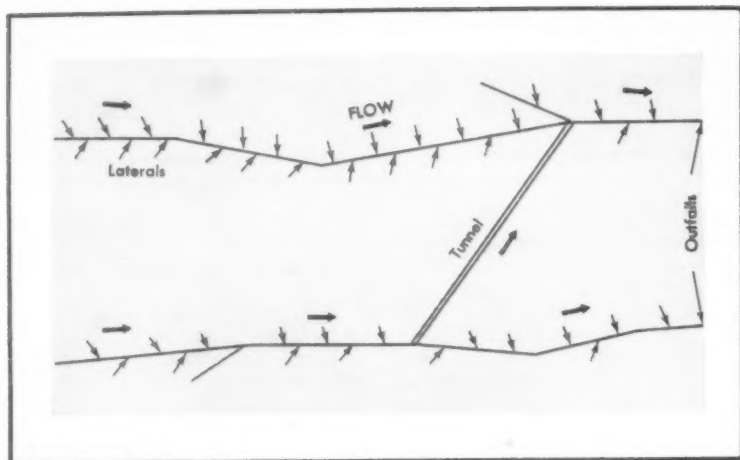
take care of all the conditions not considered. This article is concerned with calling attention to some of the exceptions.

Suppose there is a chance of invert grade such that equilibrium velocity rises from four to twelve feet per second. In the manhole between these two grades the sewage may be expected to back up to a height equal to the difference in the velocity heads, plus the losses due to changes of cross-section in the manhole and entrance loss to the downstream sewer section. So long as the water surface keeps below street grade and no cellars are flooded the condition never comes to attention and needs none. Changes in horizontal alignment, quantities added, and junctions of two or more sewers into a third all cause some backing up of flow. Just so long as velocities are not too great and sewers are a normal depth in the ground these factors cause no trouble.

In large sewers, however, velocities are generally higher than in small ones, which means that the velocity heads and losses become more significant. Moreover these large sewers may in spots have less than the normal amount of cover, and in other areas may go into deep tunnel sections. In addition there is the complication of submergence of the lower end, due to discharge into high tide waters or over a weir designed to keep out high tides. For all of these reasons large trunk sewers are very much likely to warrant a complete analysis.

Method of Analysis

In general the method of analysis consists of assuming a quantity for each line and, beginning at the lowest point in the system, usually a water surface over a weir crest the elevation of which is fixed by tide levels, work upstream computing water surface and energy levels, taking all other pertinent conditions as well as friction losses into account. The computations and associated profile show clearly the relative positions of water surface and street level along the length of the sewer. The energy level, a most



● FIG. 2 ILLUSTRATES a condition where normal design method is inapplicable.

convenient reference line, is also shown. While on the one hand smaller values of Manning's "n" are used for the big sewers than in routine design of small lines, energy losses due to change of velocity and of shape, quantity and direction, are estimated and not left haphazardly to be cared for by the depth of the sewer cover.

The designer sets up a criterion as to the minimum allowable distance between the water surface, otherwise called hydraulic gradient, and street level; or in some cases between the energy level and the street. The larger this distance is, the bigger the factor of safety. Advantage may be taken of deep cover available when a tunnel is used; likewise, when shallow cover occurs, the hydraulic grade is carefully maintained below street surface.

The usual design utilizing the composite curve already mentioned is one in which total net areas of contribution are added as the designer goes down the line from headwaters to outfall or final discharge point. The combined time of concentration and travel time that is used also increases so that the inches per hour multiplier becomes less. As a result, in large watersheds with the downstream portion consisting of small contributory areas and comparatively long sewer lengths on light grades, the computed discharge becomes less and less. Perhaps one can see how the rate of discharge at the lower end of a large diameter conduit flowing free (with no submergence at the lower end) might be less than the rate flowing in due to an initial spreading out, but certainly, if the conduit is flowing full under pressure all the way, the assumption

appears an absurdity and, because of it, a doubt as to the correctness of the method appears.

Fig. 2. shows a setup illustrating the difficulty in the use of the contributory area method. There exists a tunnel in good condition, now abandoned from its original purpose, which can be used to supplement the old line in carrying capacity. Suppose the quantity is computed to the tunnel head by the usual method. Then the flow is divided between the tunnel and the downstream sewer. The tunnel size, condition and slope are such that the flow through it takes ten minutes, and due to conditions at its lower end, flow is under pressure. In spite of this, by the standard method of computation less comes out of its lower end than goes in, for the travel time in it is ten minutes.

Rational Design Flows

But what are the design flows to use in each length? If the usual values are employed for each length, then in each length the quantity that is likely to occur but once in five years is used. It is tacitly assumed that all the lines have the maximum flow at the same instant, a condition that is quite unlikely. If each line can take its maximum without surcharging the system as a whole too badly, it is unreasonable to design the system large enough for all the maximums to occur at once, because such a condition is likely to occur very infrequently.

It would be better to add flows as one goes along, and not areas. When this is done, the writer's further opinion is that there should be a time relationship amongst the flows, a relationship that is not given by the standard curve. Going back to the original rainfall data

from the recording gauge charts, a typical five-year or other required return period storm should be deduced. If basic weather conditions causing storms were two or more in number, then two or more different five year or other return period storm curves should be drawn. Experience and judgment would still have to be used in deciding which one or more curves should be used to obtain design quantities for the sewers of any given area. The curve that gives maximum values might or might not be obvious; trials will indicate the facts.

If such a curve (the second of Fig. 1) were used in design, then there would be much more logic in assuming, for example, that a certain 10-minute rate would occur following and including a certain 5-minute one, than that, using the composite curve, the once in five-year ten-minute rate follows right after and includes the once in five-year five-minute rate.

Having decided for a given large storm sewer that the drawing in detail of the hydraulic profile and energy lines is necessary, then the proper flow to be used for each line in that computation is required. What is wanted is an instantaneous picture showing the worst condition (that is the combination of flows in the several lines leading to the highest hydraulic grade line) that past weather records and logical reasoning lead one to expect once in a certain number of years. The writer suggests the construction and use of a storm curve of the required return period, together with the described method of adding flows.

Beginning at the top of the watershed one should compute down and finally obtain at the outfall, possibly after more than one trial over alternate upstream tributary routes, the time of flow to there and the maximum quantity of flow. Then one should work back, by trial and error, and find what flow occurs in each of the upstream lines at the same time since the beginning of the storm as the already determined time of flow to the mouth, and use these values in the hydraulic grade computation. These flows will always be less than those previously obtained for each length. Thus the final quantity used in the hydraulic grade line computation for each line upstream will be less than would be used in the conventional design, and logically so, and there might be a considerable saving in the construction cost because of smaller sizes being found satisfactory.

LONGEST HIGH LEVEL BRIDGE IS LIGHTED by FLUORESCENT LUMINAIRES

ONE OF THE LARGEST construction projects in the San Francisco Bay area, the Richmond-San Rafael Bridge, was opened to highway traffic in September, 1956. This is presently the second largest bridge structure in the world, being surpassed only by the San Francisco-Oakland Bay Bridge and is the first major bridge in the United States to be illuminated exclusively by a fluorescent light source.

Construction of the project was financed by a 62 million dollar revenue bond issue authorized by the California Toll Bridge Authority. The total cost of the project is \$68,000,000. The cost of maintaining and operating the bridge

will be paid out of revenues from tolls.

This bridge provides a new crossing facility over San Francisco Bay, directly connecting the counties of Marin and Contra Costa. It forms an important link in the existing public highway system, connecting U. S. Route 40, the San Francisco-Oakland Bay Bridge and other important State Highways on the east side of San Francisco Bay with U. S. Route 101 and the north coastal counties on the west side of the bay.

In order that the bridge may serve a traffic capacity sufficient to meet estimated growth in traffic volume for a number of years, it is planned that, upon completion,



● EARLY twilight view of bridge with fluorescent lights turned on.

the bridge will be a double-decked structure with three 12-foot west-bound traffic lanes on the upper deck and three 12-foot eastbound lanes on the lower deck. It is estimated that traffic will increase from 3,900,000 vehicles in 1957, the first full year of operation to 8,200,000 in 1980.

The over-water crossing is 4.1 miles in length; however, the total length of the project, including approaches is 5.5 miles. Commencing at Point San Quentin in Marin County, the bridge consists of 2,800 feet of concrete trestle approach, which in turn connects to 1,900 feet of 100-foot girder spans. The girder spans are connected to the cantilever structure over the main navigation channel by 4,100 feet of 292-foot truss spans. The span of this cantilever structure is 1,070 feet center to center of the piers with anchor arms of 537 feet. Between this structure and the cantilever structure over the secondary navigation channel, there are 3,000 feet of additional truss spans. From this location into Castro Point in Richmond there are 3,500 feet of truss and 1,700 feet of girder spans terminating the over-water structure on an earth fill which was constructed near Castro Point and upon which are located the toll plaza and toll collecting facilities as well as administration and maintenance buildings.

The two cantilever structures provide horizontal clearances of 1,000 feet with a vertical clearance of 185 feet over the main navigation channel and 135 feet over the secondary channel. The bridge and approaches



● LUMINAIRES are mounted at 15° angle here but horizontally on deck sections.

are built on freeway standards and afford the only route in the area with grades of three percent or less, conducive to truck traffic.

The bridge and its approaches were designed for vehicle speeds of 60 mph. If we assume the average speed to be 45 mph., the stopping sight distance for a vehicle driver as recommended by AASHO is 300 feet. The lower headlight beam center of a passenger car usually joins the road 75-100 feet in front of the car. The driver will then rely on fixed lighting to detect obstacles located at more than 125-150 feet in front of the car. Should any fog decrease visibility distances, the role of fixed lighting becomes dominant.

Design Factors

The main factors influencing the lighting design for this bridge were the following: 1. A dark background exists at night; 2. The reflectance of the concrete deck surface is relatively high when dry, and low when wet and the reflectance of the plant-mixed surfacing on the approaches compared to the concrete is low when dry and also low when wet; 3. No shoulders are provided on the bridge for emergency parking; 4. The traffic will consist of both passenger cars and trucks; 5. Mounting height and structural mounting of luminaires were restricted by bridge design; 6. The two stages of construction of the upper and lower decks have to be considered, each deck providing two-way traffic for a period of approximately six months; 7. Silhouette discernment and recognition by surface detail have to be adequate for good visibility.

From the foregoing, seeing conditions should be obtained with the following requirements: (a) Photopic vision, or perception by cones, should be maintained during the entire crossing of the bridge; (b) Comfortable seeing conditions require relatively uniform pavement brightness under dry and wet pavement conditions; (c) No discomfort or blinding glare, direct or indirect, should interfere with the driver's line of vision.

The roadway installation for this project was designed to protect vehicle operators and passengers, and bridge structure from vehicle operations. Provisions for comfortable night driving and minimizing obstructions to aviation and navigation were also considered.

The fluorescent light source was selected because it provides luminous efficiency combined with a

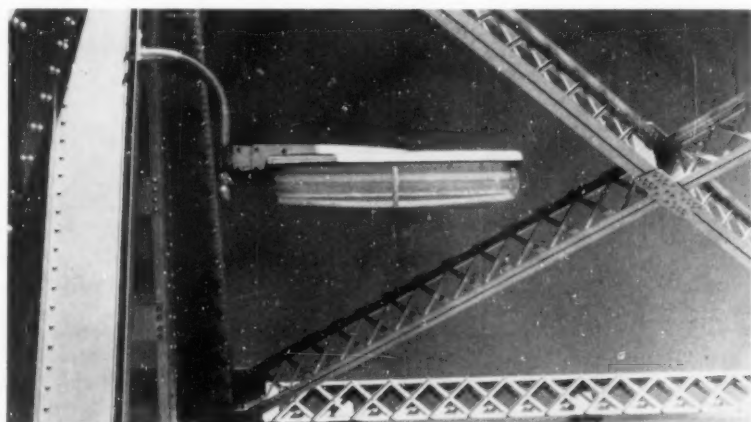
minimum glare effect, a minimum of color distortion, and long life. With several fluorescent lamps located in one luminaire, it permits the luminaire to remain lighted should one of the lamps fail.

Several luminaire mounting arrangements were studied, and the overhead position, transverse to the roadway was selected.

On the upper deck, luminaires are mounted on poles and brackets in a

tributes to the diffusion qualities of the available light and protects the inside of the unit from corrosion, dust and rain.

The photometric tests showed an illumination pattern with a maximum to minimum ratio of 5:1 and a brightness pattern with a ratio of 4:1 for a spacing of 138 feet and a mounting height of 27.4 feet. The total average illumination on the upper deck is 1.0 footcandle main-



● TYPE OF special mountings used on the cantilever sections of the Richmond-San Rafael Bridge. The fluorescent units are mounted horizontally, as shown here.

staggered pattern. Pole spacing varies from 138 to 150 feet; and mounting heights vary from 27 to 29 feet. Luminaire brackets used on the cantilever section of the upper deck are spaced from 85 to 103 feet and mounting heights vary from 18 to 20 feet.

On the truss and cantilever sections of the lower deck, the luminaires are mounted transversely, over the center of the roadway, on brackets fastened to the upper deck girders. The bracket spacing varies from 110 to 130 feet with mounting heights varying from 22 to 24 feet.

Mounting brackets supplied by the General Electric Company, manufacturer of the luminaires for the project, permitted the luminaires to be installed in two positions: (1) Horizontal position: For the lower deck and cantilever section of upper deck; (2) 15 degrees above horizontal: For the truss and plate girder spans of the upper deck and the toll plaza and approach roadways.

Each luminaire contains four 800-milliamper, 72-inch, T-12 rapid-start, standard warm white fluorescent lamps. Two alkali aluminum parabolic reflectors provide an I.E.S. Type 1 wide distribution pattern when the luminaire is in a horizontal position.

A plexiglass cover fastened securely to the aluminum hood con-

tained while on the lower deck 1.5 footcandles will be obtained.

Mechanical tests showed that luminaire displacements due to winds up to 40 miles per hour were not appreciable and that stresses in the 7-gage steel poles were conforming to calculated values. No tendency toward aerodynamic instability was exhibited.

Visibility Tests

Various visibility tests were performed. Those carried out under heavy fog conditions, showed obstacles to be visible at distances greater than the vehicle's safe stopping distances, provided that all the lights were functioning.

In order to assure a maximum of dependability for roadway lighting and other electric equipment, two 750 KVA transformers were installed. These transformers receive power directly from the Pacific Gas & Electric Company at 12 KV, and are so interconnected by a bronze armored power distribution cable, that a power outage on one side of the bay will cause the other transformer to assume the entire load until the power outage has been corrected. This switchover is automatically performed at one of the two additional substations located respectively inside the pier structure of the main cantilever tower,

at the west and east cantilever sections.

Power factor corrected 30 KW constant-current transformers located at all four substations feed the different series lighting circuits. From 24 to 27 luminaires are on one 6.6 ampere circuit. The types of circuits used are the standard closed secondary loop used for the toll plaza area and the approaches and grounded return type for feeding the luminaires located on the bridge structure.

Each circuit through a 1-conductor #6 bronze armored cable feeds external insulating transformers or ballasts. These are required to provide the necessary starting voltage and to limit the current for every luminaire. On the bridge structure these transformers are bolted to the steel members near the base of the pole or bracket and on the approaches the transformers are located in concrete boxes buried near the base of the pole.

Each group of two lamps connected in series, one on each side of the luminaire, is controlled by this transformer. Should one lamp fail, two lamps will remain lighted.

In addition to the insulating transformer a filament transformer within every luminaire assures preheating of the electrodes. With the 800 milliamperes lamps, optimum operating characteristics will be obtained with the usual ambient temperature of the Bay Area. An average lamp life of over 10,000 hours is expected, based on an assumed uninterrupted lamp usage of ten hours for each start.

Photoelectric cells mounted at all substations automatically operate each of the 18 lighting circuits independently, and consequently permit the lighting of one mile sections on the project when and where required.

Should a failure of the cells occur, it will immediately be corrected by the toll sergeant in the administration building, through manual control, will turn the defective circuits on or off from the supervisory control board. At all times this board, in addition to other functions, gives an indication regarding the operation of every lighting circuit in the entire project, and shows the operation of the navigation lights, the foghorns, and the aviation beacons

which are installed over the east and west navigation channels.

Thus, 425 luminaires, 150 navigation lights and four aviation beacons requiring 220 KW of electric power will provide 9 million lumens for the vehicular and shipping traffic passing the Richmond-San Rafael Bridge over North San Francisco Bay.

The entire project was designed and its construction supervised by the California Department of Public Works, Division of San Francisco Bay Toll Crossings. N. C. Raab, projects engineer and chief of the division, directed the project. Ben Balala was construction engineer in residence at the field office in Richmond, and H. F. Topping was design engineer at the headquarter's office in Berkeley.

For the electrical contracts, H. B. Thysell was in charge of designing the electrical facilities. J. I. Burt designed the toll collection and communication facilities which were installed by the Scott-Buttner Electric Co. E. J. Anderson was resident engineer for the electrical contracts. R. B. Marxheimer was an electrical engineer on the project.

ELECTRIC GOVERNOR

BRUCE A. ROBBINS

Manager of Engineering,
Enterprise Engine & Machinery Co.,
San Francisco, California

It's the Fastest Yet!

This electrical load sensing device anticipates speed change. Now, at the Tipp City, Ohio, municipal power plant, frequency swing has been cut from 2 or 3 cycles to less than 1/3 cycle.

RESEARCH and development conducted cooperatively by two major companies has produced an electric governor capable of startlingly accurate and fast regulation of diesel engines of any size. The companies are Westinghouse Electric Corp. and Enterprise Engine & Machinery Co. The new Westinghouse electric governor has found immediate and successful application in the municipal power plant at Tipp City, Ohio.

How the Governor Works

The electric governor not only regulates on generator frequency but also anticipates frequency or speed changes by sensing electrical load. This results in close steady-state control of electrical frequency, automatic load sharing multiple power supplies, and very rapid recovery from transient conditions.

The electrical control unit is the brains of the governor; it mounts on the engine gage board with all governor controls. It consists of three sensing or indicating circuits. The load sensing circuit is the key to fast governor response. By constantly monitoring generator load, it can detect load changes before they become mechanically evident as changes in shaft speed. Signals from the load sensing circuit are transmitted to a magnetic amplifier.

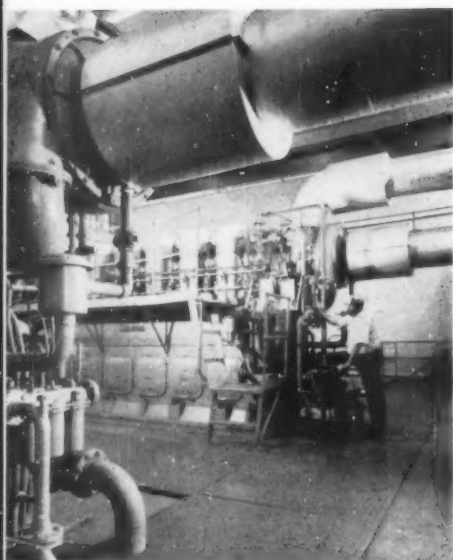
The frequency sensing circuit has the primary function of initiating governor response to small frequency changes at any one load. Supplied with a reference input of the correct frequency, it detects deviations and transmits an error signal to the magnetic amplifier. Frequency sensing accounts for the

very precise control exercised by the electric governor under steady-state conditions.

A throttle position indicating circuit provides the third basic signal. This is a feedback circuit mechanically coupled to the hydraulic actuating system. Its electric signal is opposite in polarity to the load sensing circuit signal.

An electrical summation of the three sensing circuit signals is delivered from the magnetic amplifier to the actuator unit. This is the muscles of the governor. It consists of a simple actuator with conventional hydraulic power supply and is connected by a mechanical linkage to the engine throttle.

In operation, the load sensing circuit transmits a signal at the instant of load change. Proportional to the load change, the



● **CHECKING CONTROLS** on an electric governor. This is one of the two Enterprise diesels at Tipp City, Ohio.

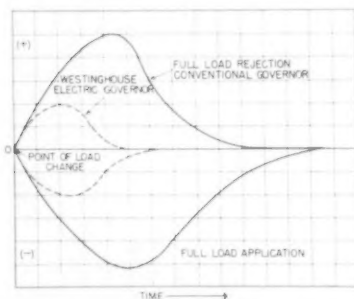
throttle is moved in a direction to compensate for the load change. As the throttle moves, the indicating circuit "feeds back" a signal opposing the original load sense signal. A "null" is reached when the throttle is at its proper new position.

Without further load change, the frequency sensing circuit and the throttle indicating circuit act together to correct any minor frequency deviation that still exists.

First Service Installation

As the commercial prototype governor neared completion, Westinghouse requested Enterprise to select a service application that would provide a good workout.

Tipp City, Ohio, was known to Enterprise as a progressive operator of its municipal power plant. Furthermore, the industrial load of the plant includes an automatic spot welding machine which is



● **CURVES** showing the comparative speed of response of conventional and electric governors for diesel engines.

estimated to cause a power surge of 500 kva. every two or three seconds. Among fluctuating loads, this would seem an excellent example to test the electric governor.

The Tipp City plant employs two Enterprise DGSQ-318 engines, each rated 1,755 bhp. at 360 rpm. and 120 bmep. They drive a pair of 1,240-kw. generators. The engines operate on dual fuel in the summer months and on diesel fuel during the winter. Through the initial cooperation of Russell Blank, former superintendent of utilities, and the continued cooperation of Walter T. Messeck, the present superintendent, this plant was selected for installation of electric governors.

Governor installation was carried on in the spring of 1955. Observation of performance during that time produced strip charts showing actual loading conditions and corresponding frequency deviations both with the original hydraulic governors and the new electric governor. Records obtained during April and June accompany this article and show the hydraulic governor performing as a single unit, and the electric governor under the same conditions. Comparison shows that the electric governor reduced the frequency amplitude from 0.6 to 0.2 cycles.

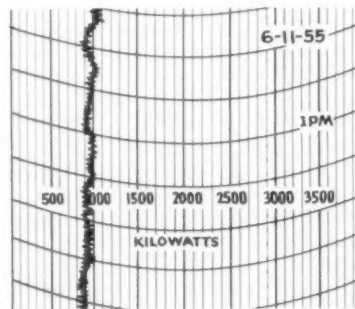
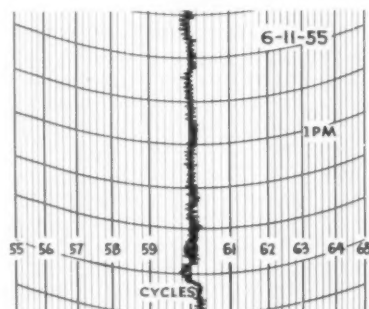
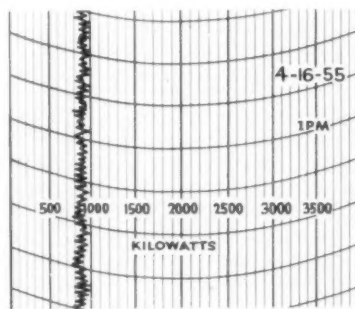
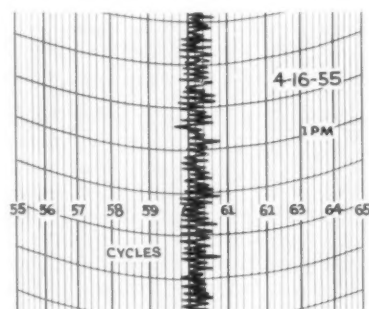
Interest in the Tipp City installation has been maintained by Enterprise engineers. Stuart F. Atsatt,

Chicago branch manager, reported in November, 1955: "At this time one engine has been operating continuously with the Westinghouse electric governor on straight diesel fuel and has performed very remarkably. The total frequency swing resulting from a bump of more than 400 kw. from spot welders has been reduced from 2 to 3 cycles down to less than 1/3 of a cycle."

Personnel

Liaison between Enterprise Engine & Machinery Co. and Westinghouse Electric Corp. has been maintained by the author and G. M. Damon, sales manager of the Westinghouse electric governor project. For Westinghouse, actual developmental work has been under the supervision of J. G. Gable, manager, and J. E. Frederick, engineering manager of the project. Much of the actual research, including governor development, was done by research engineers Kenneth Losch and Frank Rau.

At Enterprise, studies and tests were conducted by Charles Carmichael, manager of research and development, and Irving Halpern, senior research engineer. Enterprise was represented in Tipp City at the time of installation by Earl Whitney, then service engineer. Since then Harry Hansen, chief service engineer, has followed plant performance.



● **STRIP CHARTS** made at the Tipp City, Ohio, municipal power plant in April and June, 1955, show frequency deviations for both conventional and electric governors.

PLEASING THE TAXPAYERS

with Hot Mix Patching

JOSEPH P. BRUNO,
Superintendent of Streets,
Rockford, Illinois

THE PROBLEMS of a Street Department in a city the size of Rockford are many and varied. What one might term the "house-keeping problems" change with the perfecting of new equipment and materials, as well as the application of new methods. One might say that there is only one thing that remains the same year after year, and that is the attitude of the taxpayers. There is a constant demand for quicker service, better results—both to be given with no increase in taxes. The search in departments goes on for faster and more economical methods of pleasing the taxpayer.

The patching of asphalt streets has always been a major problem. Holes in the street are irritating to the taxpayer as well as being a driving hazard. It has been the experience of our street department to use for patching the same material that was used in the original construction, with the exception of concrete streets. We have found that for small pot holes, asphalt or warrenite is suitable for this type of patch. It is common knowledge to anyone charged with this kind of work that patching material purchased at the hot-mix plant will cool before it can be placed. Also, there are times when this hot plant is not producing materials. We have found that laying cold mix or cool hot mix makes only a temporary repair. The cold mix will roll with any appreciable amount of traffic riding over it. The cooled hot mix will not withstand constant traffic and will crack. This prompted us to look diligently for equipment or methods to permit us to reheat or to keep patching material hot right up to the time of application.

We found a piece of equipment that was exactly suited to our requirements. The unit fastens on the regular tailgate of our dump truck and can be removed easily whenever it is not needed. Incidentally, our tailgate heater and mixer has not been removed in over a year



● TAILGATE heater and mixer has been so satisfactory in speeding up patching work that Rockford has purchased a second unit. Here is repair gang in operation.

for we use it constantly during summer and winter.

The Wylie Manufacturing Company of Oklahoma City some time ago scheduled a demonstration at Rockford for various surrounding cities. For the demonstration we chose a heavily travelled artery and the coldest month of winter since we were anxious to find out if patching of asphalt streets could be continued throughout the winter months. The demonstration worked perfectly. These patches, laid two years ago in winter, are still intact.

The method used for patching is quite simple. We order deliveries from the hot plant and dump it in piles in our yards. Naturally it hardens, so we chip it with air hammers into moderate size pieces. The pieces are loaded into the dump truck and the crew takes off for the patching locations. In the meantime, we have lighted the propane burner which heats the jacketed pugmill mixer. Sometimes, if the distance from the yard is short, we put chunks of warrenite right in the mixer and by the time we are at the patching spot, the material is pliable and has been heated to about 275 degrees. The machine is equipped with a reversing transmission so the pugmill blades will move the material back and forth over the hot section. Depending on the size of the chunks, it takes from

3 to 5 minutes to heat a 4-cubic-foot batch. There is a preheating hopper in which an extra batch can be warming ready to drop into the mixer.

Now we are prepared to patch. The hole is first swept clean and then primed with an asphalt preparation, usually RC or MC-4 thinned with gasoline so it will brush evenly. The hot mix is shovelled into the hole and raked evenly, leaving a slight feathered edge. Then a small hand-roller compresses the material until it becomes smooth and firm. To finish, some cement dust is sprinkled on top of the finished product to prevent car tires from picking up the material. Traffic is allowed to travel over the patched chunk hole immediately. The method is fast, safe, and economical.

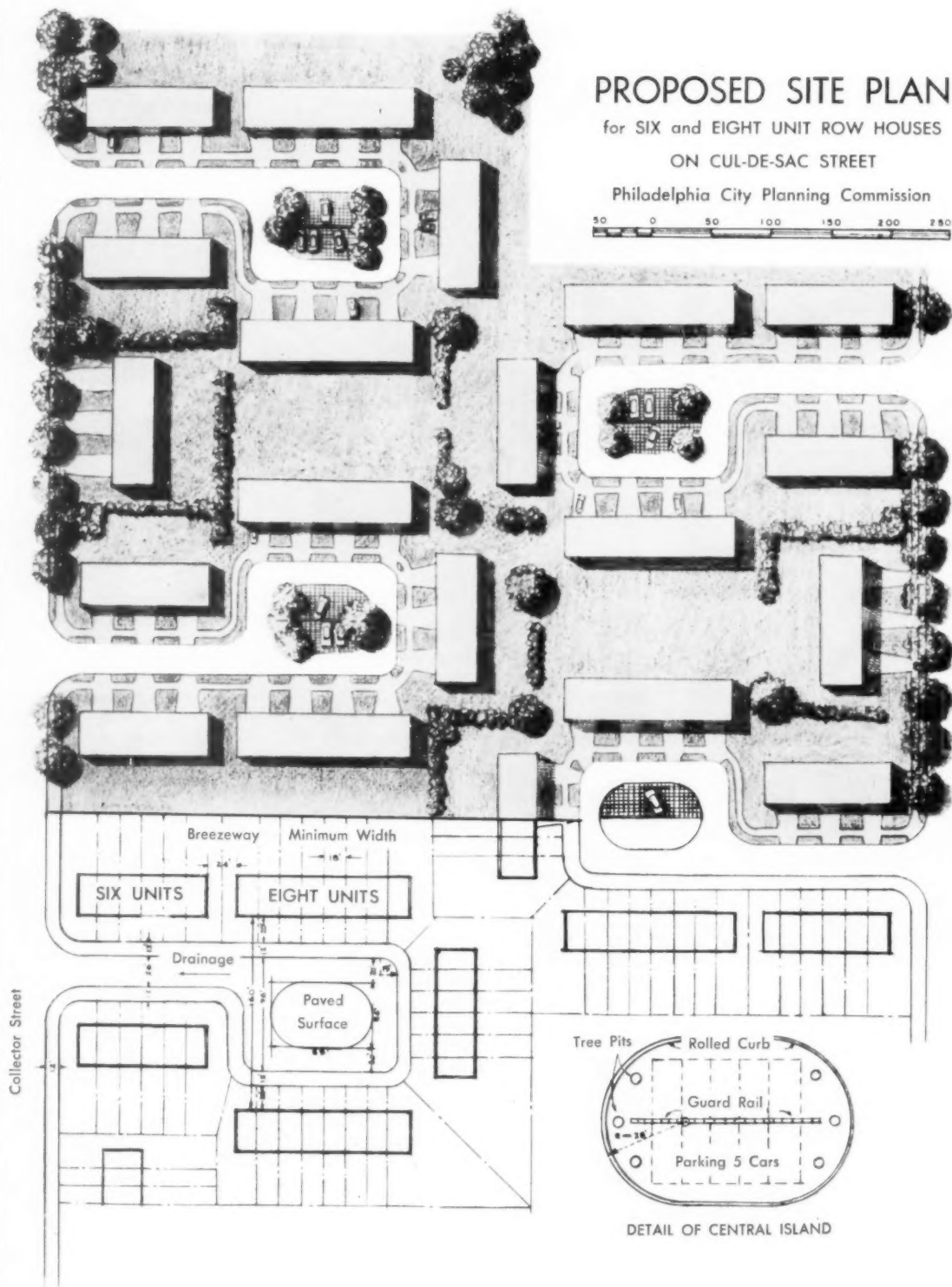
It is difficult to say how much we have increased our patching efficiency with this machine. We do know that with our former method, we could place only about one ton of material per day with a 3-man crew. We now place approximately 4 to 6 tons of material with the same crew. Based on the effectiveness and widespread public and newspaper acceptance with the Heat-A-Mix unit, we have bought a second one and have two full-time patching crews on the streets at the present time.

PROPOSED SITE PLAN

for SIX and EIGHT UNIT ROW HOUSES

ON CUL-DE-SAC STREET

Philadelphia City Planning Commission



DETAIL OF CENTRAL ISLAND

CULS-DE-SAC DESIGN FOR PLANNING SUBDIVISIONS

CHARLES L. CRANGLE, Executive Assistant, Philadelphia City Planning Commission

VERY LITTLE HAS been written on the cul-de-sac as a design concept in the planning of new subdivisions; and in the material which is available, it is far easier to find criticisms of the device than it is to find favorable mention.

The dictionary definition may be partially at fault, for Webster would make the cul-de-sac little more than a dead-end street, defining it as, "a passage or place with only one outlet, as a blind alley." Possibly this idea of a dead-end street, with its connotation of sewerage and drainage problems, loop water mains, and more expensive refuse collection, has accounted for the unpopularity of the cul-de-sac and the failure of many of the older subdivision regulations to provide for such a device at all. Fire departments and the local mail service have also been less than enthusiastic for designs of this type. Whatever the reason, it is notable that most of the earlier subdivision regulations either flatly forbade the platting of a cul-de-sac street or surrounded such platting with so many special stipulations as to thoroughly discourage the designer from attempting one.

The objections raised to the cul-de-sac are often, however, criticisms of a poor design rather than criticism of the concept itself. Where a through street is needed, the cul-de-sac is less than a substitute. Dead-end water lines may result in problems of water delivery, and inadequate turn-around space may make it impossible for delivery trucks, fire fighting apparatus and snow plows to accomplish their missions. On the other hand, a well-designed cul-de-sac may pose none of these problems.

It should be recognized that there are advantages to the cul-de-sac, particularly in big-city design. Among these advantages is the provision of safer residential streets, particularly for children and pets. It is undeniable too, that the cul-de-sac is a quieter street on which to live, and that it can be a pleasant aesthetic variation of the general residential pattern. Paramount among the advantages of the cul-de-sac is its value as a means of meeting the problem of the peculiarly-shaped tract of ground and the site of unusual topography. Through its skillful use, the subdivision designer can lay out not

only additional building lots, but lots of more attractive size and shape than would be possible if the regular street pattern were to be followed.

Parenthetically, the cul-de-sac may have a real future in our older American cities in meeting the problem of subdividing the old estate within the city limits. In these cases, a large portion of a city block has sometimes remained in one ownership while the street pattern for the area around it was established and other developments made. The shape of the estate holding may be such that running a street through the property with access from two directions is impossible. In such cases, when the estate goes on the market, purchasers are decidedly limited unless the area can be subdivided into smaller lots. One solution to the problem may well be the use of the cul-de-sac to provide a number of building sites of more modern size, thus not only keeping the property on the tax rolls but even, perhaps, increasing the amount of the tax return.

Philadelphia Usages

The question of the cul-de-sac was thoroughly studied in Philadelphia at the time the City Planning Commission was preparing its proposed Subdivision Ordinance, subsequently adopted by City Council and effective on June 4, 1954. As a result of such research, dead-end streets are prohibited, "except as short stubs to permit future street extension into adjoining tracts, or when designed as culs-de-sac." The ordinance goes on to stipulate that the cul-de-sac shall not exceed 500 feet in length and shall have at its closed end a turn-around containing a right-of-way having an outside radius of not less than 50 feet, "which shall be paved to a radius of not less than 40 feet."

The cul-de-sac has been employed in Philadelphia as a design concept for districts zoned in the "C-1" residential category. This new zoning category, adopted by City Council as an amendment to the Zoning Ordinance in June, 1954, sets new standards for row housing. It is being employed on certain tracts of open land in the northeast section of the City, and, briefly, provides for a minimum house width of 18 feet, a maximum length of 10 units to each row, and

breaks or breezeways with an average width of 24 feet. Such row houses would be placed on a street system which would separate through and local traffic and break up the monotony which has long been the objection to the gridiron pattern of row house development common in some cities.

The problem of adapting row houses to culs-de-sac has been a challenge to the Planning Commission's design staff, in view of the rectilinear and geometric shape that is inherent in the row house. The diagram herewith presents a system of interlocking culs-de-sac back-to-back and side-to-side in such a way as to exploit the site to its most economic use.

It will be noted that drainage of the cul-de-sac is toward the entrance. This is a limiting factor in the use of the cul-de-sac in many terrains, for if this type of drainage cannot be achieved, it may be necessary to run the sewer lines across adjoining lots, thus making the design uneconomical.

It will also be noted that garage access is directly from the street, rather than from a rear alley, thus providing a greater amount of green space per house. The center islands are paved, provided with shade trees and employed as parking areas. This is a departure from the more general practice of devoting such center panels to grass. It is, however, our belief that the solution here given is the more sensible one from a maintenance point of view, since grass plats in a cul-de-sac often become unsightly because of lack of attention. It will be noted, too, that a guard rail is provided across the center of the island. This is a simple device to prevent automobiles from cutting across the parking area. Finally, a rolled curb makes parking in these center panels an easy matter.

The staff of the Planning Commission is currently working with various Philadelphia builders in applying the row house cul-de-sac design to several tracts of land. It is anticipated that in the foreseeable future the interlocking cul-de-sac with the row house will overcome many of the objections currently voiced against row house living, and that the row house may again be regarded as a desirable as well as an economical type of city living.

UNDERWATER DRILL OPENS Nozzles of Sewage

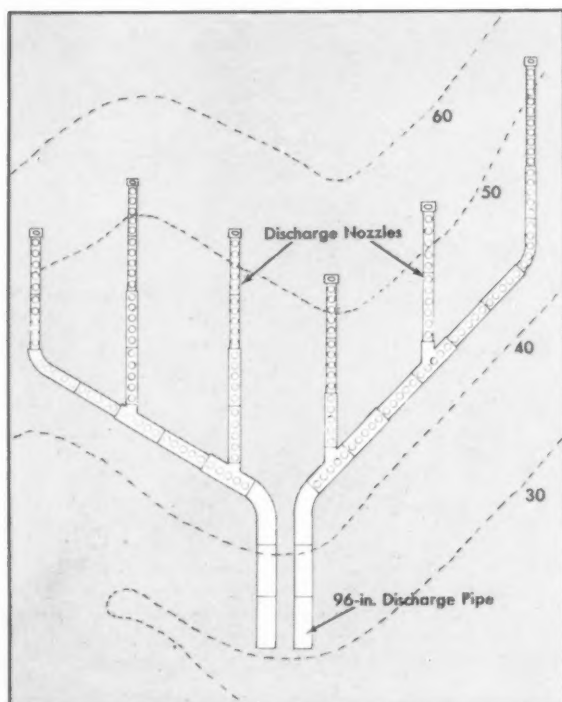
A UNIQUE SYSTEM of piping at the bottom of New York Bay, constructed 34 years ago, is used to disperse into the Bay the effluent from the Passaic Valley Sewerage Commission's Works, Newark, N. J. The sewage from a number of municipalities in the Passaic River Valley is given primary treatment and then discharged through two 96-in. concrete lines, each connected to three diffuser lines which

WILLIAM L. ACKER
President,
Acker Drill Company, Inc.,
Scranton, Pennsylvania

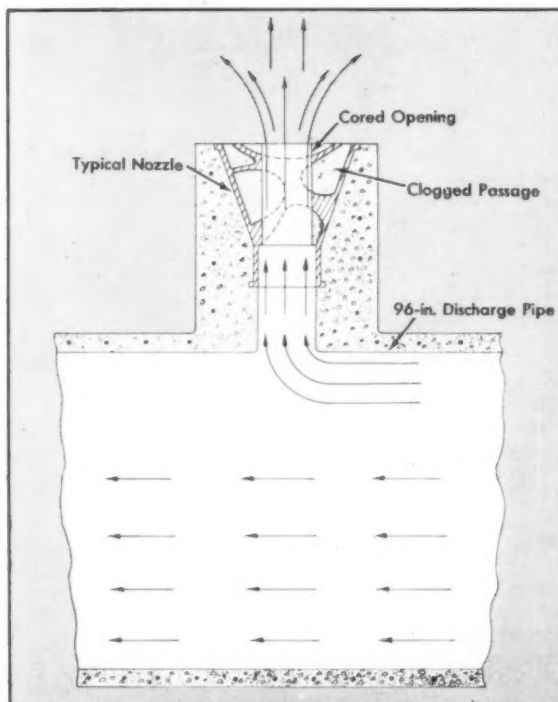
ends of the six lines. An underwater survey by divers, made about five years ago, showed that, of the 150 nozzles, 144 were completely stopped up with a hard black greasy encrustation. The discharge of up

Chief Engineer, engaged the engineering firm of Bogert and Childs to study the problem and recommend a means of correcting the conditions.

In its investigation, Bogert and Childs left no stone unturned. Old drawings, records, photographs, and reports covering the initial installation of the system were gathered and studied. Engineers and workmen who had participated in the



● ARRANGEMENT of the disposal grid beneath the water of New York Bay. Contours show depth in feet below mean tide.



● SECTION of outfall pipe with vertical branch and diffusion nozzle. Cored opening will center in clogged passage.

graduate down to 24 ins. in diameter. Along the top of each diffuser line are spaced at 10-ft. intervals 150 cast iron nozzles, each cast with an internal volute to impart a swirling motion to the effluent, thus increasing the area of dispersal.

After many years of service, it appeared from hydraulic studies that few of the nozzles were discharging. In fact, observations of the water surface over the dispersal area indicated that all discharge was taking place through the open

to 300 mgd through the remaining outlets caused unsightly boils in the New York harbor. Aside from the undesirability of this condition, the efficiency of the treatment plant was considerably reduced because of the increased hydrostatic back pressure built up by failure of the nozzles to function properly.

The Passaic Valley Sewerage Commissioners, Herman Blank, Chairman; Theodore K. Ferry, Vice-Chairman; William F. Yoe-mans, John W. White and Joseph V. McGuire, with S. A. Lubetkin,

original project were interviewed. The firm of Spearin, Preston & Burrows was retained to make an on-the-spot underwater examination of the entire dispersal field.

Results of Investigation

Results of this investigation indicated that because of the severe tidal conditions it would be impossible to drill out or clean the nozzles from the surface. Actual tests conducted under water eliminated the possibility of reaming out the nozzles with a rotary brush; nor could

Disposal Grid

they be cleaned by chipping with an air hammer. Dissolving the heavy encrustation chemically was impractical because of the tremendous volume of water. Shaped underwater explosive charges could not be used because of possible damage to the concrete mains.

After exhausting every known means of clearing the nozzles, the consulting engineers proposed the possibility of developing a core drill

relieved; and, by placing an umbrella shaped cap over the opening, the effluent would be dispersed horizontally into the surrounding water.

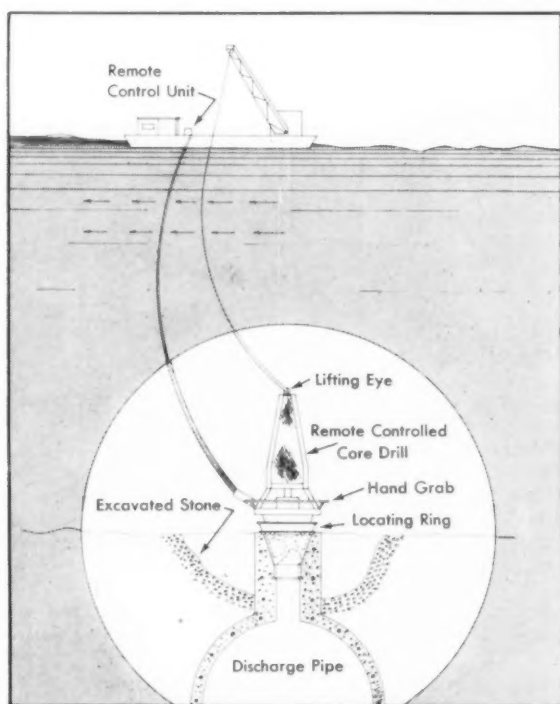
Expert Opinion Sought

Because of its reputation as a leading designer and manufacturer of core drills, the Acker Drill Company, Inc., was consulted as to the feasibility of designing and operat-

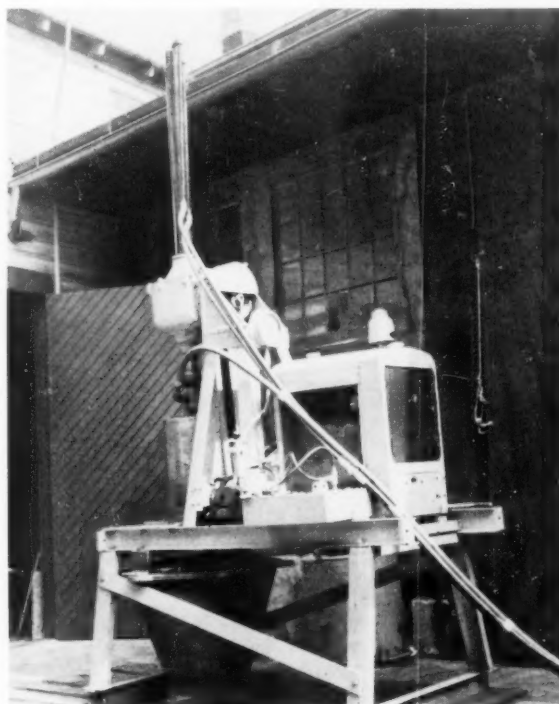
a complete engineering and test schedule. This was approved in November 1955, and the first series of tests were begun.

Development of the Coring Bit

The prime factor in any cutting bit is its ability to cut cleanly through any substance that may be encountered. In the present case, three materials had to be considered. The nozzles were constructed of a good grade of cast iron. Some were covered with concrete, while all were blocked with a black, hard, greasy encrustation. To stimulate this condition, the Acker Drill Company made up various test blocks of cast iron elbows poured full of paraffin wax and imbedded in concrete. These dummies were then



● **IN OPERATION** the core drill is positioned in a locating ring. Drilling is controlled from the unit on barge.



● **UNDERWATER** drill developed by the Acker Drill Company used dummy casting of nozzle for preliminary test schedule.

that would operate by remote control. In other words, a core drill controllable from the surface and capable of operating completely submerged under 60 feet of sea water while exposed to the strong tides of New York harbor.

The theory was that a drill could be clamped to the discharge nozzles by a diver and operated from a barge on the surface. It was felt that if a 12-in. diameter hole could be cored through the center of the nozzle, the restriction of the discharge field would be adequately

ing, by remote control, an underwater drill that could core out the clogged discharge nozzles. The importance of solving the assignment can be realized when it is understood that abandonment of the old system and construction of a new substitute would cost upwards of five million dollars.

After study of the problem, Acker engineers agreed that such a remote controlled underwater core drill could be designed and built. Also they presented for consideration of the Commission and the Engineers

placed in a test stand and cut with both diamond and carbide cutters to gain information as to the most expeditious and economical way to proceed.

For economy, this series of tests were carried out with 6 in. diameter bits rather than the 12 in. size eventually used. It is interesting to note that progress with either diamond or carbide cutters was approximately equal but that the cost of the diamond bit was much higher, thus indicating the adoption of a carbide tool. Once the advantage

of a carbide cutter had been definitely established, various bit designs were tried out and tested and the ultimately highly successful cutter developed.

Since the nozzle installation was made over 30 years ago, it was uncertain whether the nozzles conformed exactly with available old plans. To find out, an attempt was made by a skin diver to obtain on-the-spot photographs. The turbidity in the dispersal field was so dense, however, that it was impossible for this diver to discern anything more than two inches away, despite the help of two 1,000-watt underwater lights.

Nevertheless it was decided to duplicate the original nozzles as closely as possible for test purposes. It might be mentioned at this point that considerable difficulty was experienced in locating a pattern maker and foundry capable of reproducing the intricate convolute of the internal passages of the discharge nozzle. However, dummy castings were made and full scale shop testing carried out. The dummy nozzles were also useful for experimentation with various types of clamping devices to hold the drill in place. However, the idea of a clamping device was abandoned after the Acker engineering department made a complete analysis of the forces that would be exerted on the drill. From this analysis it became evident that the drill rig could be held in place by means of a locating jig and the addition of sufficient weight to the rig.

Drill Rig Designed and Built

While the preliminary testing was being conducted the drill in its final design had been completed, together with a locating jig and remote control unit. The nozzles were 28 ins. diameter at the top tapering to 14 ins. at the bottom. Over-all height was approximately 24 ins. Since the bottom dimension was only 14 ins., it is apparent that the drill had to be set very carefully to avoid having the 12-in. diameter hole off center.

Not the least difficulty in designing and testing the drill was the requirement that the core be recovered. This was important, since serious clogging could result if the cores were permitted to drop into the disposal lines. Trial and experimentation indicated that a standard springtype core lifter should recover the core. In actual practice, however, the spring core lifter did not grasp the core as expected, but instead jammed the core

tight enough in the cutting bit to permit complete recovery. Since the core continued to jam in the bit exactly the same way each time, core recovery was 100 percent successful.

Final Harbor Testing

After months of design and experimentation, the drill, control stand and guide pan were completed and full-scale tests on the dispersal field in New York harbor were started. For these tests the experienced crew of Spearin, Preston & Burrows was engaged to handle all barge work, rigging and diving. A crane-equipped barge was securely anchored over the nozzles to be experimentally cored and during the first slack water the diver descended to locate the proper casting. Once located, the nozzle was cleared of muck and slime by an air lift, and the cast iron surface chipped smooth with an air chipping hammer.

After clearing, a guide pan was attached to the nozzle by three small centering lugs. This device was nothing more than a locating jig to help guide the drill into correct position as it was lowered through the water from the surface. The guide pan and drill base were made up of truncated cones that nested so that as the drill entered, it was automatically guided into position. With the drill in place, air from the surface was introduced to a 25 hp. drive motor and cutting pressure applied to the drill spindle. Although the drill was completely submerged in 60 ft. of water, it was necessary to provide a positive stream of flushing water to the drill bit to remove grease and cast iron chips as they were cut.

Since the operator on the surface could not see or hear the drill, the control stand was provided with a complete set of gauges to indicate

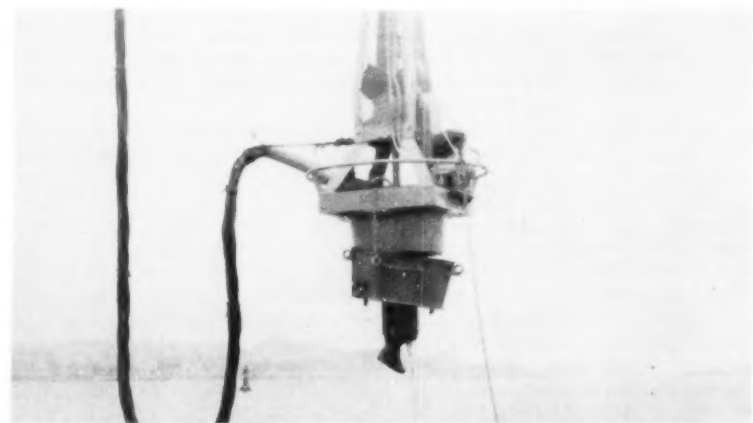
air and hydraulic pressure and an indicator to show the speed and depth of coring. When the bit cored through the nozzle, operation was immediately stopped to prevent overtravel and the possibility of pushing the core into the line.

While no attempt was made to recover a core from the first nozzle cut, progress was somewhat slow as the operator proceeded with caution and care. For nozzles Nos. 2 and 3, a core picker was inserted in the bit and cores were recovered successfully. Cutting time improved to 33 minutes per nozzle.

The success of these test results indicates conclusively that the foresight exhibited by Bogert and Childs, together with the engineering ingenuity of the Acker Drill Company will make it possible for the Passaic Valley Sewerage Commission to save its member municipalities several million dollars in replacement costs.



● TENSE moment on barge as the remote unit controls drilling test on a clogged nozzle 60 feet under water.



● UNDERWATER drill is hoisted aboard after successful test. Cutting bit protrudes beneath recovered core; guide pan hangs from drill; control cables at left.

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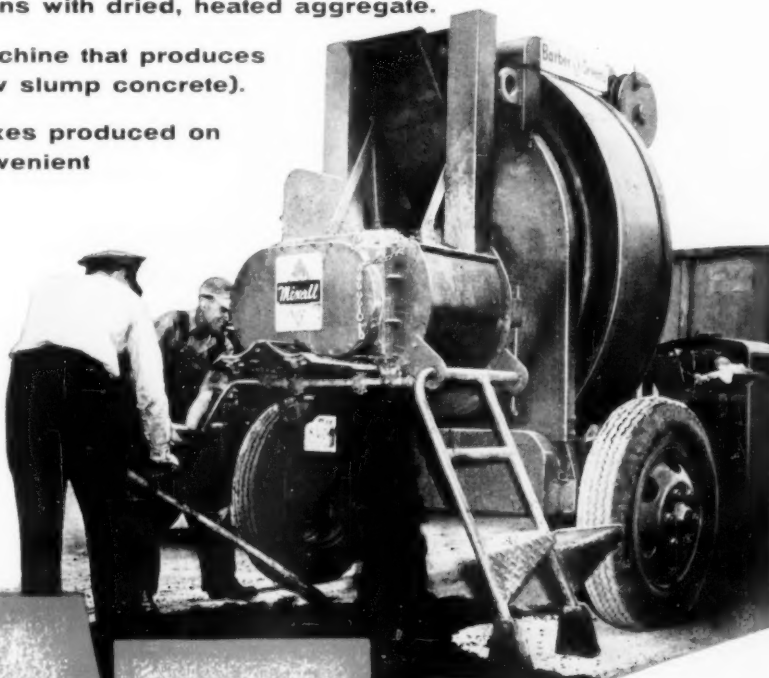
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NEWS BULLETINS

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Virginia-D.C. Chapter Holds Inaugural Meeting in Richmond

Richmond, Va.—The newly organized Virginia-D.C. Chapter of the American Public Works Association held its first meeting in Richmond, Va. J. D. Wright, Director of Public Works of Lynchburg, was elected President and Robert Hopson, Director of Public Works of Richmond, was named Vice-President. The Secretary-Treasurer's post went to John S. Crocker, Staff Engineer for the Division of Sanitation of Washington, D.C. Members named to the Executive Committee were: Walter Bonnet, Civil Engineer U. S. Army Corps of Engineers; S. C. Morrisette, Director of Public Works, Norfolk, Va.; Leo Weaver, Sanitary-Engineer, U.S. Public Health Service; and G. H. Ruston, Manager, Roanoke Waterworks. Speakers at the Inaugural meeting included: APWA President Edward P. Decher, Newark, N.J.; Harold I. Baumes, Executive Secretary of the Virginia League of Municipalities; and Robert Bugher of the Associations' headquarters office in Chicago, Illinois.

Dubuque Engineer Elected President of Iowa Chapter

Ottumwa, Iowa—The Iowa Chapter of the APWA held its 4th Annual Conference in Ottumwa on October 24-25. Eighty-two persons were in attendance. The program included talks by Mayor Oscar Stoltz of Ottumwa and Mayor Glenn S. Stech of Waterloo. Other speakers on the program were Colonel John L. Wilson, District Engineer U. S. Army Corps of Engineers, Rock Island, Illinois, Gordon Hess, of the Morton Salt Company, Carl Fagerlind, Street Commissioner of

Waterloo, Adrian H. Koert, Traffic Engineer with the firm of George W. Barton and Associates of Chicago, and Leo Weaver, Sanitary Engineer, U. S. Public Health Service, Washington, D.C. Bob Allen, Public Relations Representative of the Milwaukee Braves Baseball Team was the guest speaker at the annual banquet which also featured the John Morrell Chorus.

Kenneth Cullen, City Engineer of Dubuque, was elected President of the Chapter at the business meeting. Others elected to office were: Paul Roberts, Director of Public Works, Sioux City, Vice President; William D. McElwee, Assistant Director, Department of Public Works, Ames, Secretary-Treasurer; and Robert Price, City Manager of Ottumwa and L. H. Adams, Street Commissioner of Waverly, Board Members-at-Large.

Michigan Members Elect

Farmington, Mich.—The October meeting of the Michigan Chapter featured the annual election of officers, which resulted in the selection of Harold Hultquist, Managing Di-

rector of the Concrete Pipe Association of Michigan, as the new President of the chapter. Mr. Hultquist, who formerly served as Director of Public Works of Livonia, succeeds Jan Schmedding, Supt. of Street Construction and Maintenance of the City of Detroit. J. B. Jewell, Supt. of the Department of Public Works of Pontiac, was named first Vice-President; Fred Cheek, Village Engineer, St. Clair Shores, was elected Second Vice-President; and C. A. Johnson, City Engineer of Midland, was named Third Vice-President. The Secretary-Treasurer's post went to Chester F. Mozena, Supt. of the Department of Public Works of Lincoln Park.

County Official Named President at San Diego

San Diego, Calif.—A new slate of officers was elected at a recent luncheon meeting of the San Diego-Imperial Counties Chapter. The results of the election placed John W. Davis, Assistant Commissioner of the San Diego County Road Department, at the helm of this fast growing chapter. Mr. Davis suc-



● IOWA Chapter officers, left to right, Carl Fagerlind, past president; Kenneth Cullen, president; William D. McElwee, sec'y-treas.; and Robert Price, board member.

OFFICERS: Robert Anderson, Winnetka, Ill., President; Sol Ellenson, Newport News, Virginia, Vice President. REGIONAL DIRECTORS: (three year terms) Albert G. Wyler, New Orleans, La.; Wm. D. Hurst, Winnipeg, Manitoba, Canada; Frederick Crane, Buffalo, N. Y.; (two year terms) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (one year terms) K. K. King, Phoenix, Arizona; Charles W. Cooke, Hartford, Conn.; R. V. Moschell, Alcoa, Tennessee. Immediate Past President, Edward P. Decher, Newark, N. J. Donald F. Herrick, Executive Director.

ceeds Virgil L. Larson, Right-of-Way Supervisor for the Pacific Telephone and Telegraph Company as President. First Vice President is Ernest A. Taylor, Street Superintendent of Oceanside; Second Vice President is Warren A. Barney, Chief of the Engineering Division of the San Diego County Public Works Department; and the new Secretary-Treasurer is E. A. Lawrence, a Consulting Engineer of La Mesa, California. Members elected to serve on the Executive Committee include: Richard Gallagher, Director of Public Works, City of San Diego; Norman Beenfeldt, Division Engineer, California Water and Telephone Co., National City; Ray Preston, District Manager, Griffin Company (general contractors), San Diego; Albert Smelko, Supt. of Public Works, La Mesa; and Phil Davenport, President, Southern Equipment and Supply Co., San Diego.

The guest speaker at the meeting was Lew McCorison, Superintendent of Equipment for the City of San Diego. Two films were also presented, one showing construction work on the Garrison Dam in North Dakota and the other, furnished by the International Harvester Company, was titled "From Trash to Treasure" and illustrated the use of heavy equipment in sanitary landfill operations.

Subdivision Problems Discussed at Northern California Meeting

Berkeley, Calif. — The annual meeting of the Northern California Chapter was held in Berkeley, November 9. Dr. Dan Adler, Associate Professor of Psychology of the University of California gave a very informative talk at the opening luncheon titled "Human Relations In Supervision."

Mr. Robert Glenn, Associate Engineer of the Institute of Transportation and Traffic Engineering of the University of California, presided at the afternoon sessions which featured talks on subdivision regulations, legislation and field construction problems. Participants included: Walter Kaitz, Counsel and Coordinator of the State Senate Interim Committee; John I. Hennessey, Executive Vice President, Associated Home Builders; E. E. Phillips, Director of Public Works, Hayward; Alfred J. Zavatero, Pacific Gas and Electric Co.; W. Mason, Director of City Planning, Richmond; E. Clement, Contractor, Centerville; E. G. Kitchen, Pacific Telephone and Telegraph Co.; Thomas Bell, Assistant Director of Rede-

velopment, San Francisco; Lawrence Livingston, Jr., City Planning Consultant; and J. K. Nye, Department of Public Works, State of California. After the meeting the members and their guests enjoyed a reception and the annual dinner.

Utah Chapter Holds Meeting With State Municipal League

Salt Lake City, Utah — Eighty members and guests attended a breakfast meeting of the Utah Chapter held in conjunction with the 49th Annual Convention of the Utah Municipal League.

The program included talks by Mr. E. G. Johnson, Utah State Highway Engineer, and Dr. Elroy Nelson, Vice-President of the First Security Corporation and Chairman of the Highway Committee of the Salt Lake Chamber of Commerce. This was followed by a panel discussion titled "Relationship of Highway Planning to Local Communities" with Mr. Earl Udall, City Manager of Provo, presiding. Other members of the panel were: W. L. Anderson, Secondary Road Engineer, Utah State Highway Commission; Ben Andrews, Salt Lake County Road Superintendent; and Harold Carter, Consulting Engineer of Salt Lake City.

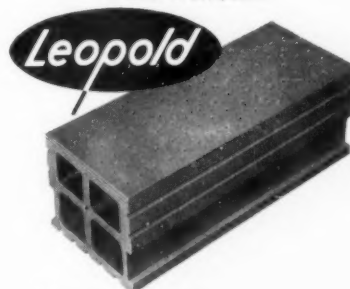
Mr. Joe L. Christensen, Commissioner of Streets and Public Improvements of Salt Lake City, was elected President of the Chapter at its business session. John E. Mackay, Salt Lake County Surveyor and Engineer, was named First Vice-President and William D. Core, Supt. of Streets of Ogden, was elected Second Vice-President. Miss Lyla Ray, Secretary of the Utah Municipal League, was re-elected Secretary-Treasurer of the Chapter. Executive Committee members include L. W. Myers, Assistant City Engineer of Salt Lake City and Immediate Past President of the Chapter; and Carl E. Painter, George W. Poulsen Jr., and Rex O. Gleave, who are Consulting Engineers of Salt Lake City.

New Officers Installed at Manitoba Chapter Meeting

Winnipeg, Man. — The annual meeting of the Manitoba Chapter was held in Winnipeg on October 26th. Highlight of the meeting was the installation of the officers for the coming year. M. L. Jeroff, Municipal Engineer of West Kildonan, assumed the reins as President of the Chapter by succeeding James Scaife, Municipal Engineer of St. James. W. Walterson, Public Works Foreman of Selkirk, became Vice-Presi-

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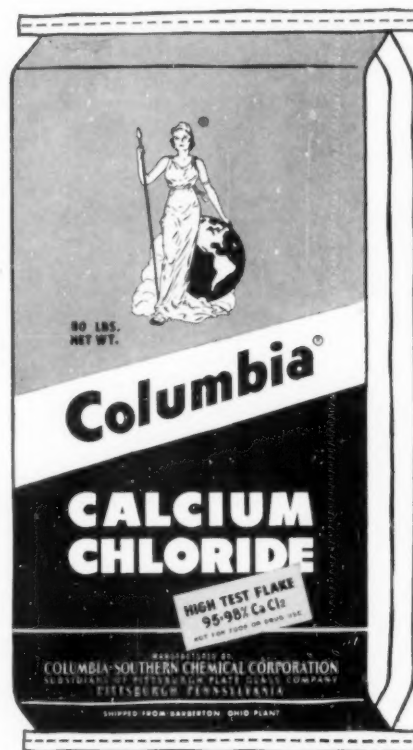
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dent; and C. A. Keeping, Engineer of Roads and Streets of Winnipeg, was re-elected to serve as Secretary-Treasurer of the Association's only Canadian Chapter. Others elected to the Executive Committee were: E. Simpson, Engineer of Inspections, Winnipeg; and I. Simkins, of the Simkins Construction Company of Winnipeg.

Booth Elected First Prexy of North Dakota Chapter

Mandan, N. D.—The North Dakota Chapter held its initial meeting in Mandan on October 5. Robert

Anderson, Village Engineer of Winnetka, Illinois and newly-elected President of the Association, was the guest speaker and discussed the activities and service of the APWA.

Edward J. Booth, City Engineer of Bismarck, was elected first President of the new Chapter; John Kleven, Supt. of Streets and Sanitation of Grand Forks, was named Vice-President; and Eugene Pope, City Engineer of Wahpeton, was elected Secretary-Treasurer. Members elected to the Executive Committee were: W. Vernon Fahy, Director of Public Works, Minot; C.

M. Hagen, Supt. Water, Sewers and Streets, Oakes; Herb Arnold, City Engineer, Williston; and Erik Peterson, City Engineer, Jamestown.

New Orleans Members Hear Louisiana Highway Official

New Orleans, La.—The October meeting of the New Orleans Chapter featured an interesting talk on State Trucklines and Federal-Aid Highways in the New Orleans Metropolitan Area. The speaker was Mr. Grady Carlisle, Assistant to the Director of the Louisiana State Highway Department. The meeting was held in the Gas Department Auditorium of the New Orleans Public Service Building. S. di Benedetto, Engineer of the Sewerage and Water Board of New Orleans and President of the Chapter, presided at the meeting.

• • •

Power Sweepers Clean-Up Quickly After Parade

Following the Fiesta Parade in San Diego, Calif., were four power sweepers which cleared the streets of litter and debris and left the route clean for normal use within a few minutes after the parade passed.

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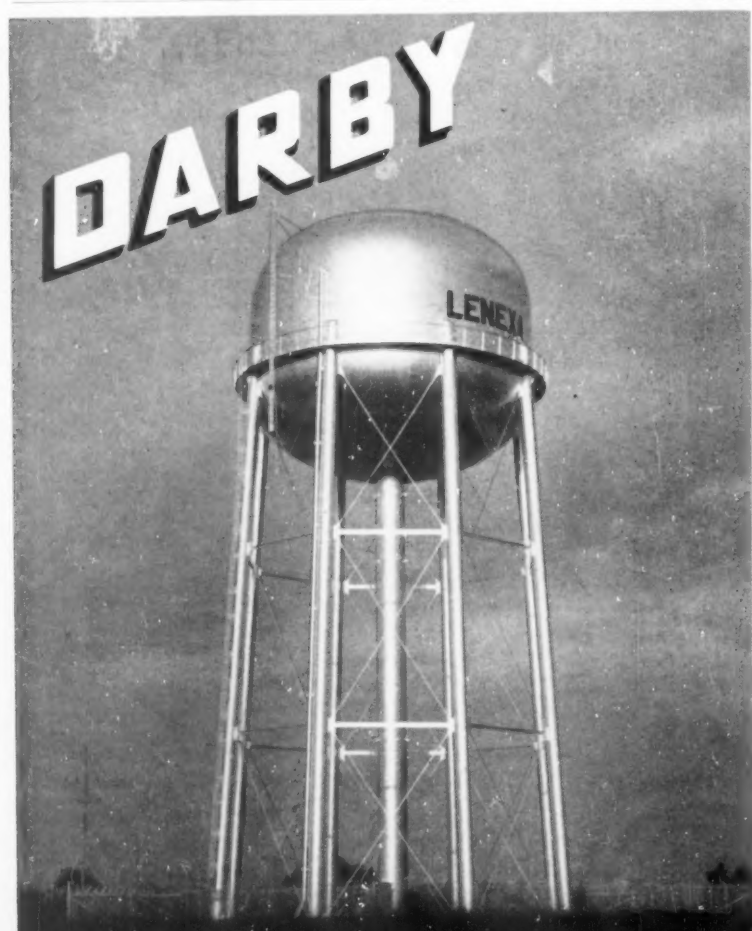
GEORGIA HIGHWAY CONFERENCE, the Sixth Annual meeting will be held at the Georgia Institute of Technology, Atlanta, Feb. 25 and 26. Secretary of the Conference is Radnor J. Paquette, Professor of Civil Engineering.

SOUTH DAKOTA Water and Sewage Works Conference elected as President, Leonard Haddorff of Wessington Springs and Roy Heiens of Philip as Vice President for 1956-57 at its 22nd annual meeting. Directors chosen are Edward Gaisbauer, St. Paul; William Malloux, Sturgis; Lyle Meadows, Watertown; Francis McNeary, Aberdeen; Wallace Johnson, Huron; and Harold Tormey, Mitchell.

• • •

Revenues from Garbage and Sewerage Charges

A study by the Municipal Finance Officers' Association indicates that some 300 cities were collecting \$40 million per year (\$2.84 per capita) for refuse service charges and \$99 million a year (\$3.25 per capita) for sewer rental charges.



DARBY


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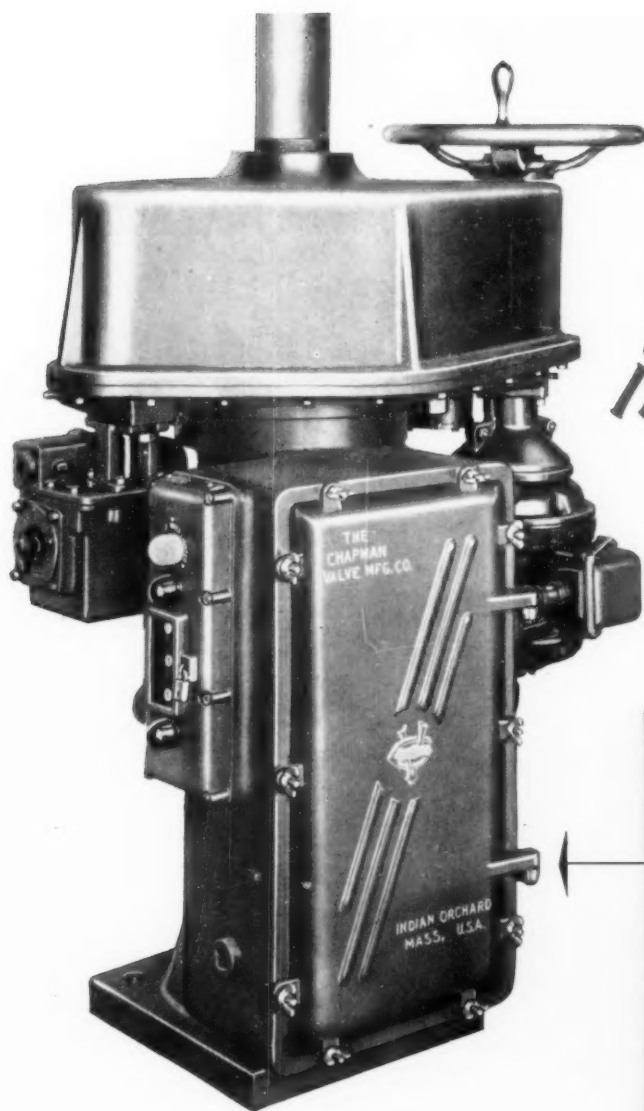
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PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Incinerator Causes Minimum Air Pollution

Glendale, Calif., has built an incinerator with a daily capacity of 90 tons which, because it is in the smog-plagued Los Angeles basin, is notable because its discharge to the air contains not more than 0.3 grain of particulate matter per cu. ft.; the legal limit being 0.4 grain. The incinerator contains rammed stoking, controlled movement of the burning material across the grate, water scrubbing of exhaust gases, and forced draft in the combustion chamber. The water scrubber includes 5 horizontal baffles which the gas passes over and under, meantime being subjected to a powerful, fine water spray. The furnace was built by the American Corp.

"New Incinerator Promises Less Smog," *Engineering News-Record*, Oct. 11.

Equipment for Sanitary Landfill

Cities which are operating landfill successfully all have adequate equipment. Too small or too few machines are ineffective. By careful initial planning, tractor travel should be reduced to a minimum and unnecessary rehandling of cover material be avoided. A tractor front-end loader is recommended where loads must be carried a short distance and overhead loading of trucks is necessary. For land clearing and preparation, tractor bulldozers, with a scraper attached are useful. A power shovel or tractor-mounted Hystaway is needed for excavations deeper than 8 ft. or in marshy areas that do not allow free tractor travel. A sample selection for a city of 35,000 population would cost about \$20,000. Depreciation at 10%, fuel, grease, etc., small tools, and \$5,200 in salaries would give a total annual cost of \$12,975, or about 58 cents a ton, not including collection.

"How to Plan a Successful Sanitary Landfill Program." By Eldon P. Koetter, of Caterpillar Tractor Co. *PUBLIC WORKS*, November.

Cage for Entering Sewer Manholes

Because of the corrosiveness of its sewage, the manholes in the sewers of San Diego, Calif., were built with acid-proof brick and without iron ladder rungs. Some of the manholes are more than 30 ft. deep, and entering them has presented a problem. At first, rope ladders were used, but they were fatiguing to climb and were always swinging around. Their use has been replaced by cages 22 in. in diameter and 6 ft. high with a light mesh covering over the top, bottom and 2/3 of the way up the sides which permits the sewage to flow through while the cage is on the bottom. This cage, with a man inside, is lowered and raised by a boom truck, which also lowers materials and tools into the manhole.

"A Better Method for Entering Sewer Manholes." By John W. York, Senior Foreman. *PUBLIC WORKS*, November.

New Design of Sludge Digesters

Conventional designs of digesters provide relatively large diameters, shallow depth and relatively flat bottom. Most regulatory agencies require 3 to 6 cu. ft. per capita capacity. Because of the accumulation of inert sludge, grit and scum, it is doubtful that more than 1/3 to

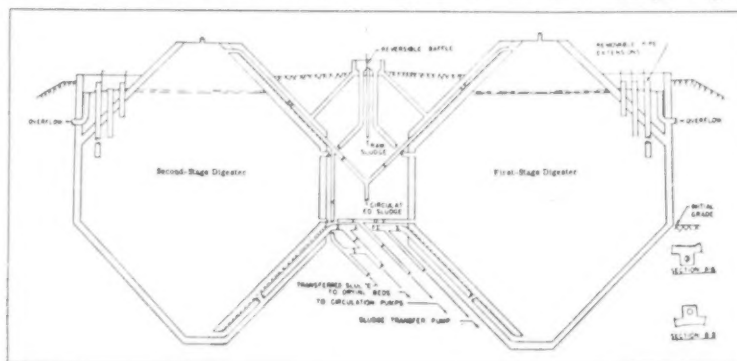
1/2 of the total volume in many conventional digesters is effectively utilized. The author describes a typical design used in Germany, which approximates a sphere, the horizontal diameter and depth of which may be as great as 30 meters, and the capacity about 1 cu. ft. per capita. With this as a basis he presents designs proposed for single-stage and two-stage digesters. The walls at top and bottom are on 1:1 slopes, with a flat bottom 3 ft. in diameter. As the surface of the liquid is comparatively small and all the gas passes up through it, there is little tendency for scum to form. The liquid depth is equal to the maximum diameter. The design is based upon weight of volatile solids added per day rather than per capita.

Plants of this general design built in Kansas have not cost materially more than conventional ones of similar capacity.

"Apply Recent Research to Design of Separate Sludge Digesters." By Gordon E. Mau, of Kansas State Bd. of Health. *Sewage and Industrial Wastes*, October.

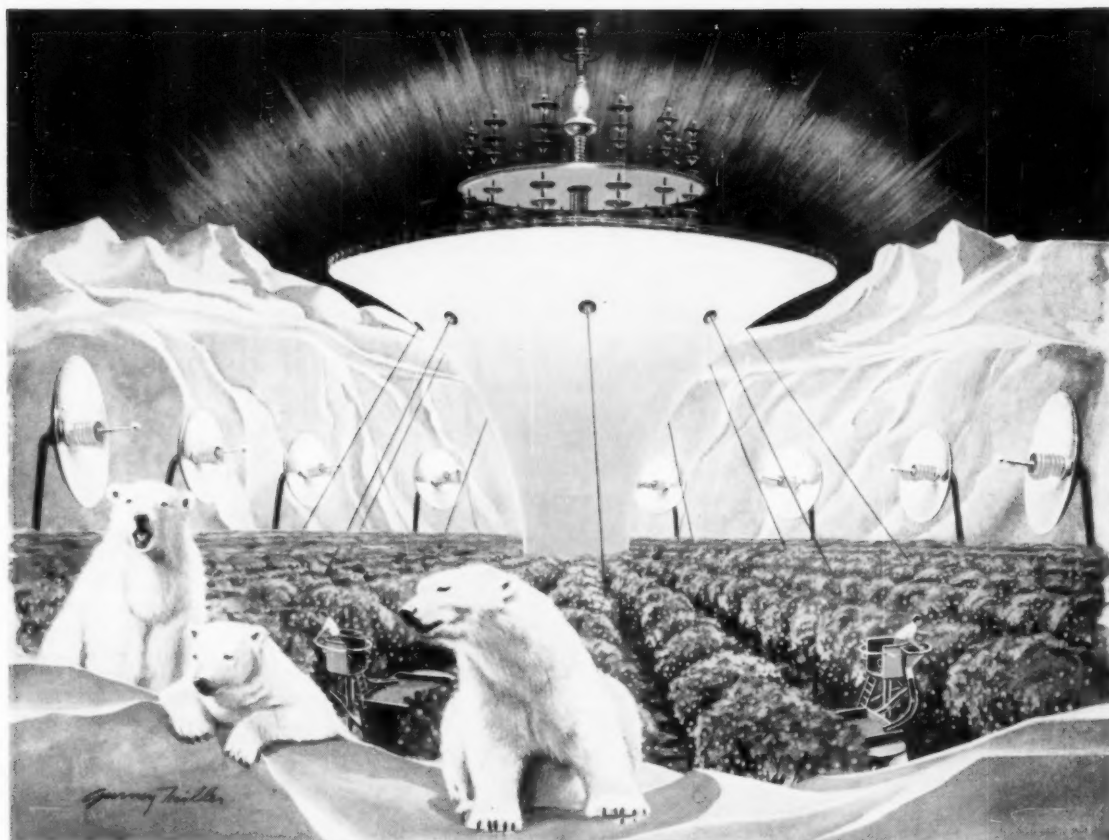
Reducing Rotation Rates of Vacuum Filters

The District of Columbia Sewage Treatment Plant in March, 1955, reduced the rotation rates of its vacuum filters in order to coordinate filter cake production with the operation of the new sludge drying



● DESIGN recommended for two-stage digesters and accompanying sludge piping.

Courtesy Sew. & Ind. Wastes



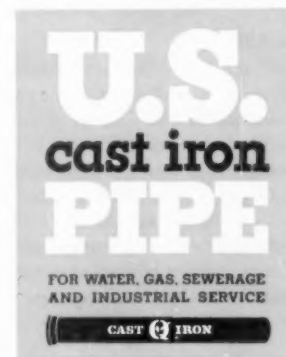
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equipment. This resulted in a drier, thicker filter cake with a reduction in the use of ferric chloride from 5.37 to 4.11%. The average moisture content of the filter cake was reduced to 68.6% from the previous average of 72.0%.

"Extract from Annual Report of the D. C. Treatment Plant for 1955." *Sewage and Industrial Wastes*, October.

Radiotracer in An Oxidation Pond

At Philip, S. Dak., a study was made of flow characteristics in a sewage oxidation pond in winter,

when the pond was covered by ice, by use of a radioactive tracer. The pond, or lagoon, is about 200 by 100 ft. with an average depth of about 2 ft. There was open water for about 25 ft. in all directions from the inlet, which is about 50 ft. from one end of the pond. There is no outlet. The flow into the pond ranged from 5,800 to 58,800 gpd. Radioiodine as NaI in basic solution was used as a tracer. Geiger tube probes in waterproof bags were inserted through holes in the ice at about 50 points. It was found that stratification of the fresh sewage occurred over a large area of the

lagoon. The radiotracer mixed with the pond contents much more rapidly than had been anticipated, which indicates that an adequate description of pond contents can be obtained from a relatively small number of routine sampling points, especially in summer, when wind action assists in mixing the contents.

"Field Use of Radiotracer in a Sewage Oxidation Pond Flow Study." By E. C. Tsivoglou, D. A. Pecosok and R. F. Valentine, of the Robert A. Taft Sanitary Eng. Center. *Sewage and Industrial Wastes*, October.

English Report on Effects of Syndets in Sewage

An English committee appointed in 1953 by the Minister of Housing to investigate the effect of synthetic detergents has reported, concerning their presence in sewage at treatment plants, that 33 of 44 biological filter plants reporting had experienced some foaming, ranging from "slight" to "a depth of 4 to 6 ft." Attempts to control foaming had included spraying with effluent; adjustment of the operation of activated sludge plants to increase the concentration of suspended solids in the aeration tank; and use of defoamers. Spraying has been reasonably successful at some plants. Use of the second method, increase of suspended solids concentration, is limited by the primary need to insure that at all times the oxygen demand of the mixed liquor is satisfied, and by insufficiency of pumping capacity. Chemical defoamers have attracted attention; one based on petroleum oils has been used by one of the largest plants in the country. A concentration of 2-3 ppm of the sewage flow appeared to be effective at a cost that is not prohibitive. However, the presence of oil in the stream receiving the plant effluent may be objectionable. At least two large activated sludge plants have controlled excessive foaming by extending the purification cycle to the nitrification stage.

"Synthetic Detergents in Sewage." By John Finch, Mgr. of Sewage Disposal at Slough, England. *Water and Sewage Works*, October.

Protozoa and Activated Sludge

The author studied the protozoa found in activated sludge plants and found that different species flourished under different plant conditions. Especially significant seemed to be the predominance of either




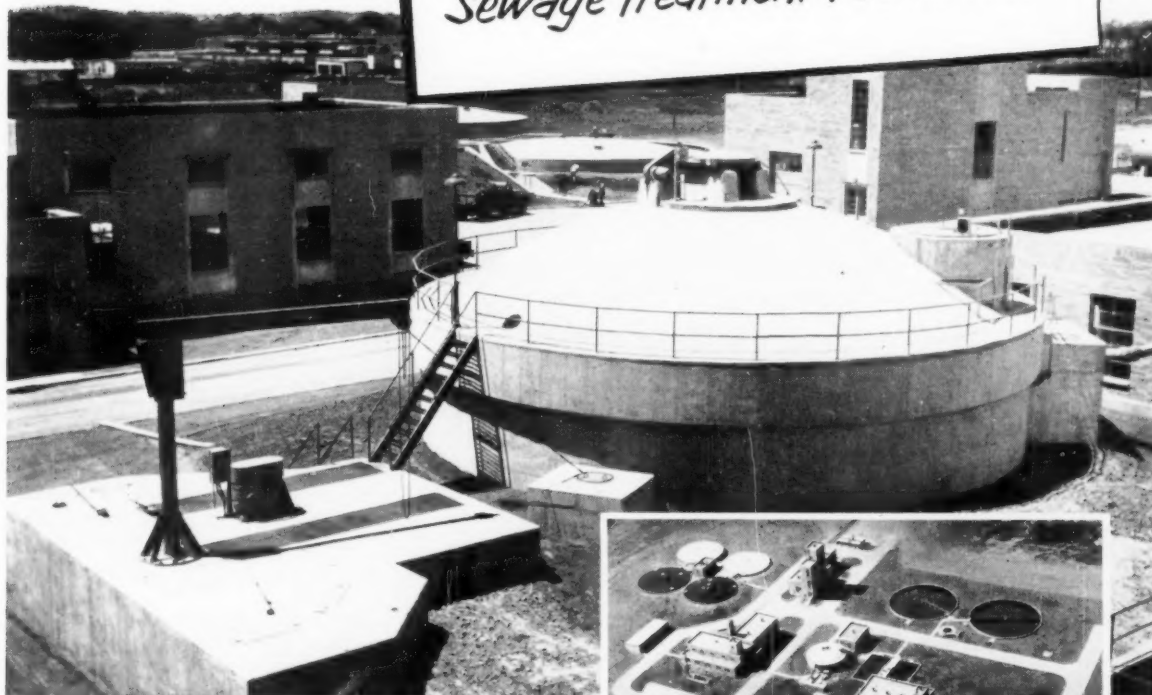
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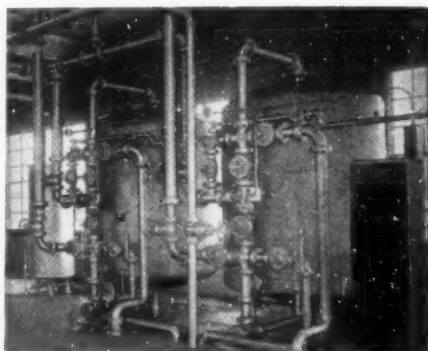
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holophytic flagellates or ciliates. There is a definite succession of protozoa as activated sludge is formed and becomes more efficient, and a knowledge of the function of each can be used as a guide to operation; the condition of the sludge can be determined more quickly in this way than by other indications, since observations of protozoa can be made by microscopic examination, thus giving an immediate warning of approaching trouble. *Holophytic Mastigophora* predominate at low efficiency; *Holozoic Mastigophora* indicate slightly greater efficiency. When the number of free-swimming *Ciliata* is very high the efficiency is approximately 50%. These types are at the low side of the efficiency scale; the presence of stalked ciliates and higher animal forms such as rotifers indicates the high side of the scale and a low BOD effluent. Immediate warning of changing conditions gives the operator opportunity to forestall lowering of efficiency.

"Protozoa and Activated Sludge."

By Ross E. McKinney and Andrew Gram, of Mass. Inst. of Tech. *Sewage and Industrial Wastes*, October.

Studies of Limited High-Rate Sludge Digestion

In a study of methods to increase the capacity of the Bergen County, N. J., sewage treatment plant with the least increase in size, the existing sludge digestion facilities were operated at an increased rate. While the process now in operation is not true high-rate digestion, the rate has been considerably accelerated. It has been concluded that maximum plant construction economy can be obtained by utilizing a system which employs a denser sludge and a high degree of agitation. Although it has not been possible to investigate maximum loading, the present plant could accept at least 125% of the current solids load with a high degree of efficiency, giving sludge of a satisfactory quality from a primary digester; but it is beneficial to utilize a secondary digester to remove larger quantities of volatile material and to obtain better separation of the liquid and solids. During the study, scum layers did not increase in thickness. Supernatant from the secondary digester could not be relied on to maintain a sufficiently low solids content, necessitating a tertiary digester to protect the primary sedimentation and secondary treatment processes.

"Increased-Rate Sludge Digestion Studies." By H. R. Zablatzky, M. S.

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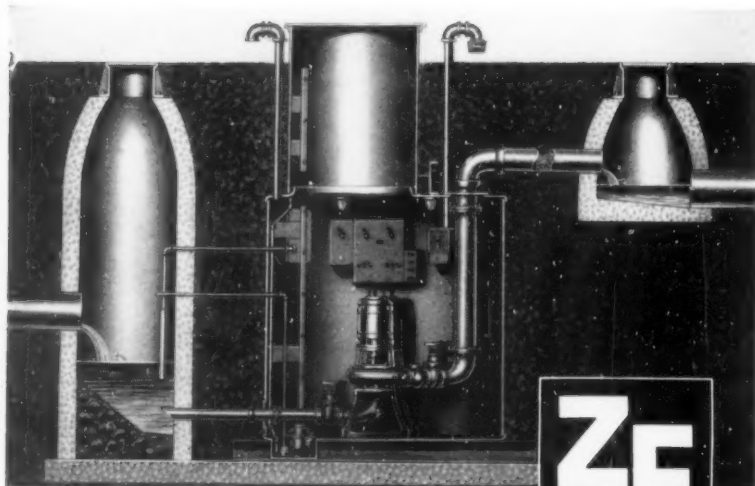
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Cornish and J. K. Adams, of Bergen Co. Sewer Authority. *Sewage and Industrial Wastes*, October.

Foaming in Treatment Plants

This paper reports on experiments designed to give a quantitative comparison of the frothing ability of raw sewage, primary effluent, mixed liquor, activated sludge final effluent, trickling filter effluent, and the supernatant from anaerobic digestion; also on the effect of added syndets. The study was made by the Sanitary Engineering Laboratories, Queen's University, Kingston, Ontario, using Kingston sewage. It was found that the frothing tendency of domestic sewage increased from raw sewage to the final effluent. The supernatant liquid from the anaerobic digesters gave the greatest froth production. The addition of domestic anionic type detergents to different sewage fractions increased the froth production. The sewage constituents decreased the frothing ability of the detergent. Determination of "Active anionic agent" in sewage is of only slight value in indicating the frothing tendency.

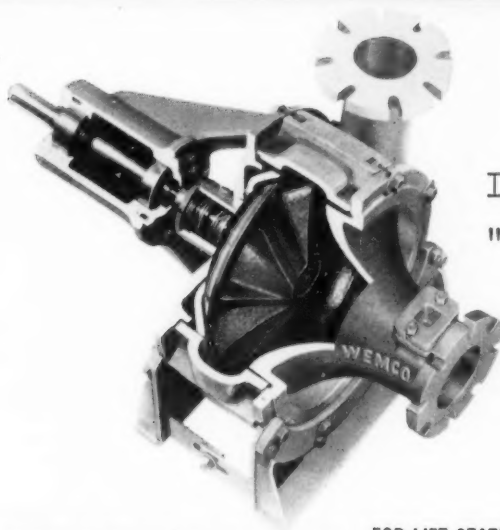
"Pilot Plant Studies of Frothing in Sewage Treatment Plants." By L. A. Munro, M. Yatabe, and W. J. Abrams, of Queen's University. *Sewage and Industrial Wastes*, October.

Predicting Performance Of Vacuum Filters

The author could find in the literature no satisfactory theoretical approach to designing pressure or vacuum filters which considers the time of pressing, or the yield on a rotary vacuum filter, and how they are affected by initial moisture content of the sludge, final moisture content of the cake, time of pressing and cake thickness (for pressure filters), time of revolution (for rotary filters), and the specific resistance of the sludge. He has developed equations which enable performance of rotary vacuum filters and pressure filters to be predicted from simple laboratory determinations of specific resistance. The equations and derived curves should also lead to a better understanding of the economics of filter plant operation and make possible the determination of the best method of operating an existing facility.

"Vacuum Sludge Filtration: Prediction of Filter Performance." By B. R. S. Jones, of University of London, England. *Sewage and Industrial Wastes*, September.

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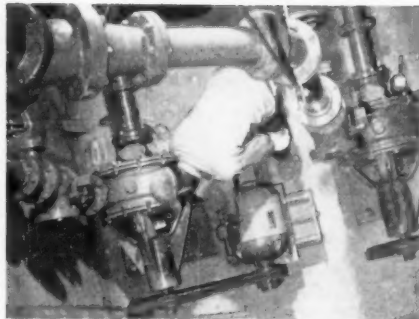
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*Taken from consultants specifications for sewage and sludge pumps.

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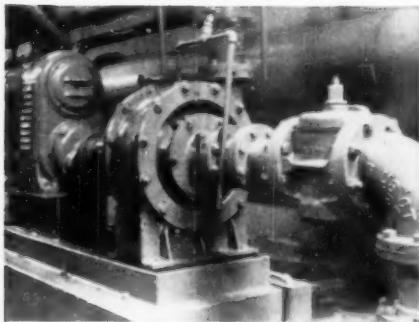
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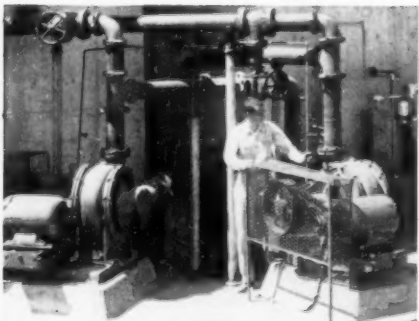
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Drive: V-Belt, Varidrive or direct connected (Most models)

General Specifications:

Size: 2" through 8"
Material: Cast Iron or Ni-Hard
Capacities: 50 GPM to 2500 GPM
Heads: Up to 100'
Necessary Clearance
Adjustment: None
Models: Horizontal or Vertical (Most sizes)
Drive: V-Belt, Varidrive or direct connected (Most models)

General Specifications:

Sizes: 2" through 8"
Material: Ni-Hard
Capacities: 50 GPM to 2500 GPM
Heads: Up to 100'
Necessary Clearance
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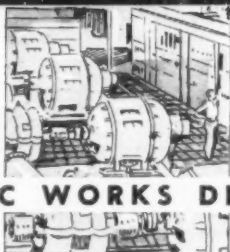
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Controlling Maximum Demand Rates

Where large cities supply water wholesale to small communities, commodity charges alone do not properly compensate for the plant and transmission mains required, and the rates charged frequently contain demand provisions. To keep the charges down, the user must develop a means of control to limit maximum demand rates. This generally requires equalizing storage in the amount of 15-25% of the maximum daily usage. If ground storage is sufficient, it may be desirable to reduce the demand rate by pumping from it during peak hours or days. Rugged and dependable demand or rate-indicating appurtenances to the conventional, high-accuracy, volumetric type of meter are not available. The problem can be solved by means of conventional and dependable control equipment, and the author describes a control system, and its use at Kirkwood, Mo., using an orifice or venturi primary device and butterfly valves.

"Problems of Penalty Rates and Control Facilities". By Vance C. Lischer. *Jour. AWW Ass'n*, Sept.

Quality Requirements of Industrial Water

Industrial water quality requirements are often relatively easy to satisfy. Up to 75% of the industrial water intake is used for cooling, the primary quality factors of which are temperature, corrosiveness and suspended silt. Boiler feed usually requires special treatment, which is commonly provided by the user. Manufacturing industries can generally use water suitable for domestic use. However, special qualities are required for the manufacture of TV tubes and by beverage

and food packing industries. Those required for brewing, food packing, leather processing, textile manufacturing, paper manufacturing, chemical manufacturing and other purposes are described in the article.

"Industrial Water Quality Requirements". By R. D. Hoak, of Mellon Inst. *Public Works*, November.

Diatomite Filtration and Sand Filtration Compared

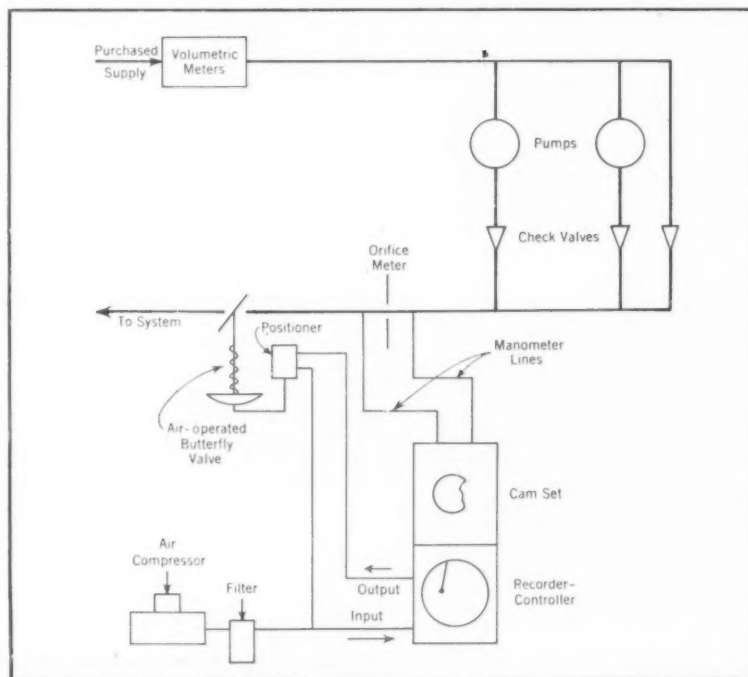
A study of diatomite filtration of more than six years' duration is the basis of this comparison. Water for both diatomite filters and sand filters was taken from the Raritan river. The major operating cost of diatomite filters is the filter aid. In this test no attempt was made to regulate closely the amount used, but enough was used to keep the plant operating smoothly. Filter aids are commercially available in about ten different permeabilities or flow

rates. The greater the permeability the less the clarity of the effluent if the water contains semicolloidal solids. The data collected show that the cost of diatomite filtration of raw water is approximately equal to the cost of sand filtration plus pretreatment, but somewhat higher if cost of pretreatment be added; but cost reductions are possible. Water produced by diatomite filtration had acceptable clarity and consistently met bacteriological standards with no more than 0.2 ppm chlorine residual.

"Comparison Studies of Diatomite and Sand Filtration". By George R. Bell, of Johns-Manville Co. *Jour. AWW Ass'n*, September.

Lynchburg's Vertical Filter Plant

Lynchburg, Va. in 1955 began the enlarging of its water treatment facilities by adding a 7 mgd filter



Courtesy Journal AWWA

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SPLIT COUPLING CLAMP

plant. The most novel feature of this was the arrangement of the several elements vertically instead of horizontally. This was suggested by two conditions. Land was not readily available for horizontal extension of the plant; and the source of supply to the plant was at a considerably higher elevation. This head was utilized by placing the filters about 85 ft. above ground level, on the seventh floor of the building and extending into the sixth floor, the remaining space of which was occupied by the pipe gallery. The fifth floor is used for chemical storage and solution vats. The feeders and

the chemical supply hoppers are situated on the fourth floor; also the wash water pump and booster pumps for the higher-pressure surface-wash supply and the laboratories. The third floor is all devoted to the meter testing shop, sand-blasting, drying and acid bath, and warehouse for small waterworks supplies. The second floor contains toilets, locker rooms, garage, and shops for motor vehicles, hydrant and valve repairs, tool storage, etc. The first floor serves as the department's headquarters, business office, cashier's counter, etc.; also it contains the chlorine storage, boiler

and mechanical equipment. Provision is made for adding a television tower reaching to the highest elevation within the city limits. To save vertical space, electrically operated valves are used instead of conventional hydraulic cylinders. To save horizontal space, walls are made of fluted, vertical insulated aluminum wall panels, 11 inches thinner than brick walls would be.

"A Filter Plant That Grew Up".
By W. M. Johnson, Cons. Engr. Water & Sewage Works, September.

The Forested Watershed of Hanover, Pa.

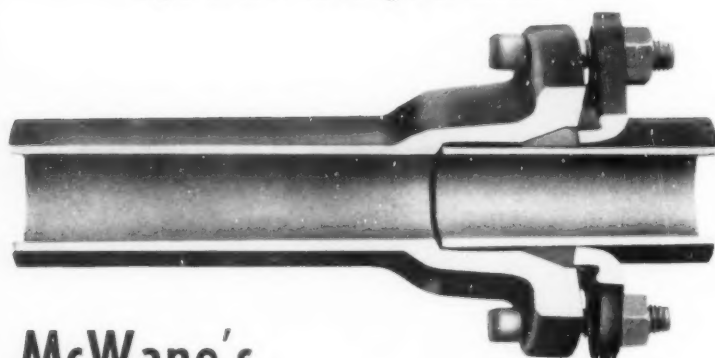
Hanover and adjoining communities, with a total population of about 22,300 obtain their supply from a watershed covering 1514 acres, of which 1257 acres is well forested, 1,493,152 pines having been planted more than 20 years ago. It is used as a game preserve, in which are at least 300 deer and also turkeys, pheasants and rabbits. Multiflora rose bushes planted along the principal road provide berries as winter food for birds. Fire breaks 80 ft wide have been cut at intervals of 1800 ft through all forested sections. When these fire breaks were cut, trees above 6-in. diameter were sold for pulp; smaller ones and all trimmings and brush were passed through a chipper and the chips left for mulch. These fire breaks, of which there are 18 miles, are disked at intervals to keep brush down.

"Forested Water Shed Maintenance Operation". *Public Works*, November.

Surge Control In St. Louis, Mo.

Surge control in the recently constructed additions to transmission mains in St. Louis has been uncommonly difficult to plan because of the variable thickness and diameter of the pipes and the presence of branches, which cause reflected waves. In pump discharge conduits, the water hammer is affected by rate of discharge-valve closure, rotation effect of pumps, pipe profile, and damping effect of the distribution system. It is difficult or impossible to predict the combined effect of all these. To be conservative, the designer provided more surge valves than probably are needed. Vacuum and air relief valves of the slow-closing type are installed at critical points, and at every location where it appeared that they might be needed small valves of the quick-closing type are placed. Vacuum

Quick Shipment!



McWane's MODERN 20-Foot LENGTHS 2" and 2 1/4" CAST IRON PIPE

McWane 2-inch and 2 1/4-inch centrifugal CAST IRON PIPE in 20-foot laying length has all the well known characteristics of Super-DeLavaud larger-diameter pipe—smooth, straight barrel, even wall thickness, sound metal section, easy to cut and easy to tap.

But, it has fewer joints to make, lower construction costs. Every time you lay a pipe, your line grows 20-feet longer.

Service connections are made with standard corporation cocks for water and standard No-Blo tees for gas. Standard strap saddles or service clamps can be used if preferred.

Write or telephone nearest McWane Sales Office.

McWANE CAST IRON PIPE COMPANY GENERAL OFFICES & FOUNDRIES, BIRMINGHAM, ALA.

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*Let us remember the mountains of Attica
and not abandon our land*

"There are mountains in Attica which can now keep nothing . . . but which were clothed, not so very long ago, with fine trees producing timber . . . while the country produced boundless pasture for cattle . . ."

As early as 300 B.C., when Plato thus lamented a tragedy of exhausted natural resources, there was little left of Attica's fertility — only insects crawling about the "sites of extinct water supplies." A lesson 2000 years old, to be heeded if we would escape the fate of Attica.

And the first logical step in vital water conservation is to replace flat, waste-conducive rates with Badger Metering.

The demand for water is at its peak in our history. All classes of users compete for more and more. A 75% increase in consumption is expected by 1975. In some areas the situation is already critical.

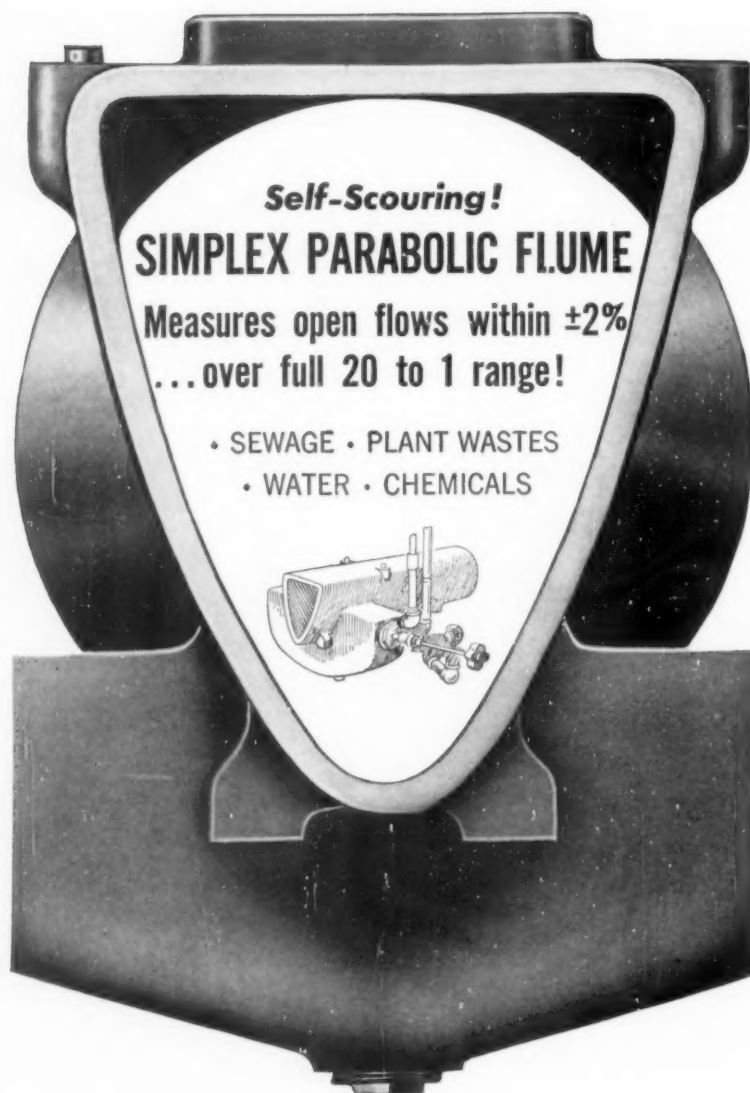
Curtailling waste with Badger Meters — fairly apportioning the responsibility and accounting for water use — is not only a sound investment in your community's future, but essential to its very survival.

The time to act is now — while there's still some water left to save! Write today for information on Badger Meters, or to arrange for a representative to call.

Badger Water Meters



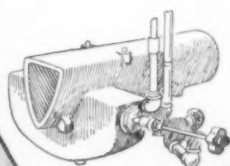
Badger Meters have conserved it for 50 years
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Self-Scouring!
SIMPLEX PARABOLIC FLUME

**Measures open flows within $\pm 2\%$
 ...over full 20 to 1 range!**

- SEWAGE • PLANT WASTES
- WATER • CHEMICALS



Simplex Type S Parabolic Flume saves you the high costs of building a concrete structure to close tolerances, changing piping to make a special approach section.

It's easy to install! Levelling pins assure proper grade. Flanged, bell or spigot inlets are in 6" to 36" standard pipe sizes.

Type S Flume is used alone to indicate flow; with meter to record and totalize.

Smooth transition from circular main to parabolic form speeds flow, keeps flat invert clear! Throw of lever gives quick back-flushing. Big chamber traps sediment, keeps piezometer hole clean!

WRITE FOR BULLETIN 800

SIMPLEX VALVE & METER COMPANY, DEPT. PW-12
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Accurate instruments and controls since 1904

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 VALVE AND METER COMPANY

and relief valves are installed in pairs. The author describes the operation of the system under various conditions, some of which disclosed unexpected effects and defects. Little is known, he says, about surge relief afforded by the distribution system.

"Water Hammer Problems at St. Louis". By Frank E. Dolson, Supt. of Dist. Jour. AWW Ass'n, September.

**New Algicides
 For Water Control**

There are a number of chemical groups which contain compounds that are algicidal. Promising ones include inorganic salts, organic salts, rosin amine compounds, antibiotics, quinones, substituted hydrocarbons, quaternary ammonium compounds, amine derivatives, and phenols. Algicides which are selectively toxic to algae producing tastes and odors, to those which clog filters, to the bloom and slime producers, and other interference types, would be particularly valuable. A promising start has been made in this direction but there are as yet no completely new algicides which would appear to be safe to recommend at present for use in public water supplies. Copper sulfate and chlorine are less expensive than any of the others mentioned.

"Evaluation of New Algicides for Water Supply Purposes". By C. Mervin Palmer, of the Robert A. Taft San. Eng. Center. Jour. AWW Ass'n, September.

**Factors Affecting
 Filtration Rates**

The trend in filtration practice has been toward increased rates of filtration, increased sand sizes and thinner beds. Some municipal plants, although designed for 2 gpm per square foot, are successfully operated at rates as high as 3 gpm per square foot during periods of high demand, and especially when the water is warm. The studies analyzed in this report bring out relationships between sand sizes, filtration rates, terminal losses of head, and bed thickness. Any one of these design parameters may be altered by suitable adjustment of one or more of the others.

The indiscriminate adoption of filtration rates above 2 gpm per square foot should not be encouraged. Rates above 2 gpm per square foot may be adopted, however, if there has been sufficient experience to establish limiting values of the filterability index (preferably 5



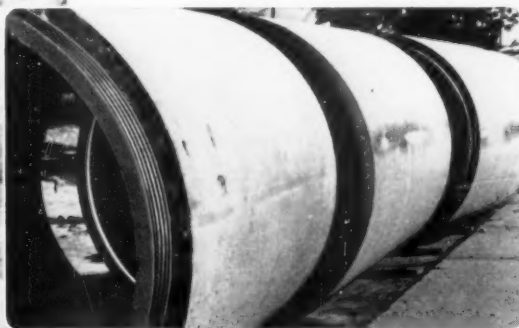
In CANADA, too . . .



Engineers choose

TYLOX

Rubber GASKETS



To Speed Pipe Work . . . Assure Leak-Proof Sewers

The question "what pipe joint?" for coupling this sanitary sewer line in Sarnia, Ontario, was quickly resolved by the engineer and other officials of the project . . . TYLOX, they knew, would offset slow trench work with fast pipe-laying, assure leak-proof joints with a flexible, *compression-tight* seal, and, being made of rubber specially compounded to resist sewage and industrial waste acids, would make the joints "leak-proof for the life of the line."

The Sarnia project is typical only of how waste disposal authorities *everywhere* specify TYLOX Rubber Gaskets to assure lower installed cost

and long, trouble-free service life of pipe lines they design. Proving this trend is the fact that there are more TYLOX Gaskets in low head service than all other gaskets combined.

In designing *your* rubber-jointed pipe lines, make sure you specify TYLOX Rubber Joints. They have no "equal" in ability to meet *all* requirements of engineers, contractors and taxpayers alike.

Write for our brochure, "Joint Enterprise." It contains engineering data and fully illustrated case histories showing why TYLOX Rubber Joints are specified the world over to assure the economy, safety and longevity of sewerage and drainage pipe lines.



PROJECT: Sarnia, Ontario, Canada—Sanitary sewer.

ENGINEER: D. Silliman, City Engineer for Sarnia, Ont.

CONTRACTOR: Keystone Construction Co., Ltd., Windsor, Ont.

PIPE: 54" x 8' reinforced concrete, Tylox-Jointed pipe, furnished by Niagara Concrete Pipe Ltd., St. Catharines, Ontario, Canada.

5049

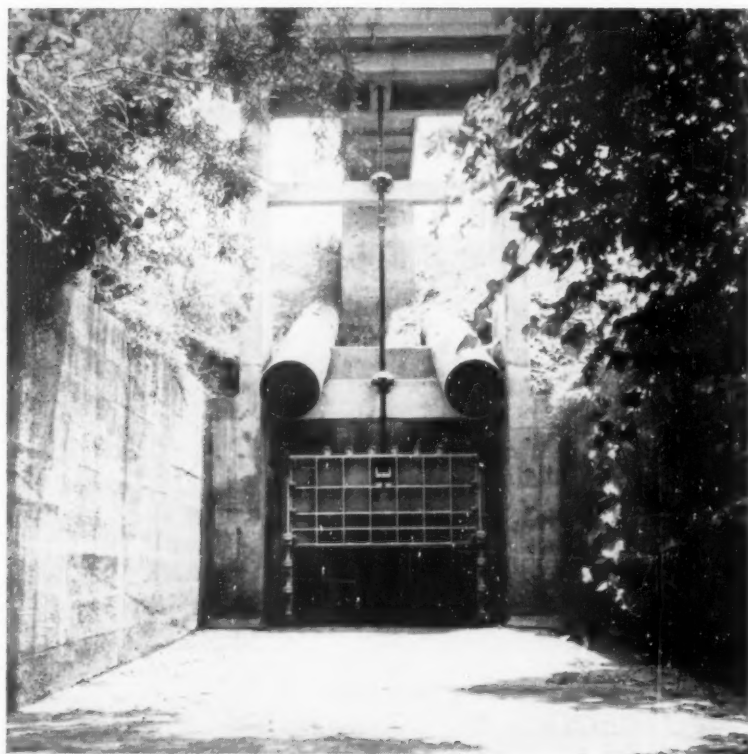
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**Permit Maximum Flow
Require Minimum Structure
Give Tight Closure at Bottom of Culverts**

Located between high ground and Red River, Louisiana, Lake Fort Buhlow drains excess water by gravity through two 4-foot x 5-foot box culverts. When Red River overflows its levee, Lake Fort Buhlow can no longer discharge its overflow by gravity. At such times a 96-inch x 48-inch Rodney Hunt Hy-Q® Flush Bottom Closure Sluice Gate closes tight, holding back the river so that pumps can discharge lake water through two 30-inch pipes.

The Rodney Hunt Hy-Q Flush Bottom Closure gate offers design flexibility and other exceptional advantages for water filtration, sewage treatment and many other sluice dam, channel and chamber flow control applications.

Catalog No. 75 gives complete information and specifications on Rodney Hunt Hy-Q sluice gates. Write for your free copy.

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HUNT**

years or more) obtained by operation in the plant under consideration or in nearby plants filtering water pretreated in a manner similar to that proposed, using water from the same source.

The criterion upon which filter design may be based to meet the most critical water quality requirements is the filterability index, which has been modified to be defined as:

$$\frac{Vd^3h}{L}$$

Limiting values of this index may be determined by operation of one or more filters over a period of a number of years to the point at which actual breakthrough of turbidity may possibly occur.

"Factors Affecting Filtration Rates." Study made for Nat'l Academy of Sciences. By Herbert E. Hudson, Jr. *Jour. AWW Ass'n.*, September.

Experiences With Membrane Filters

Use of membrane filter procedure at the Shreveport, La., water works was found to be highly accurate and time-saving in clearance testing of new pipelines. It was 23 times as costly as lactose broth application alone, and 8 times as costly as the full lactose BGB test.

Research at the Virginia Polytechnic Inst. indicated that the procedure might be modified in several respects. A dark background facilitates counting. Thermos incubation is adequate if certain precautions are taken. For the test sample, 32°C. gave higher coliform counts than did the recommended 35°C. incubation temperature. Coliform organisms may be successfully incubated on MF membranes at any level of relative humidity above 35%.

"Use of Molecular Filter Membranes for Water Plant Control Tests and Clearance of New Pipelines". By A. Adler Hirsch, Water Purif. Supt., Shreveport, La.

"Effects of Media, Temperature, and Humidity on the Development of Coliform Organisms on Molecular Filter Membranes". By John D. Eye, James G. Gardner and Jack F. Neel, of Virginia Polytechnic Inst. *Jour. AWW Ass'n.*, September.

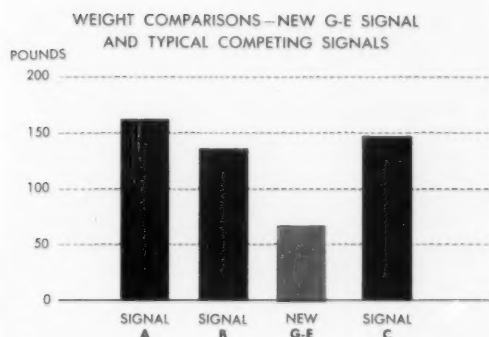
Aluminum Roof On a Supply Reservoir

The Las Vegas Water District has covered a 30 mg reservoir with sheets of corrugated aluminum. The roof has an area of 229,500 sq. ft. The aluminum is 0.024 gage. The sheets are 4 ft. by 8 to 10 ft.; sup-



G.E.'s new aluminum Signal

**Lightest by far, but still the most rugged.
Fast and economical to install, too!**



COMPARISON SHOWS that the new G-E aluminum signal is less than half the weight of its lightest competitor. Chart based on comparison of 3-color, 4-way, adjustable span-wire suspended signals.

Actually 45% lighter than existing models—and a major step forward in simplified, functional design! Here's one of the greatest advances in traffic control equipment that the industry has seen for years—the all-new General Electric lightweight traffic signal!

LIGHT WEIGHT means quicker, safer, easier installation on busy intersections—saves money, too, since there is less need for heavy, costly poles and span wires. Design provides for minimum use of tools—sections may be added or removed easily, rotated 90 or 180 degrees and locked in place with only one bolt. Snap-on door and lens assemblies simplify and lessen your maintenance problems.

FOR FULL INFORMATION on these new signals, contact your authorized G-E traffic distributor or Apparatus Sales Office, or write Section 453-68, General Electric Company, Schenectady 5, N. Y.

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GENERAL  ELECTRIC

Dispose of garbage



Handle almost any job with "do-it-all D"



Maintain airports



Level land



Haul from hopper, shovel



Clean-up before paving

We haven't listed *all* the things D Tournapull can do. Frequently it does the work of several pieces of high-priced, specialized equipment. But, chances are you could find applications for the "D" we have never thought about.

That's one of the big advantages of this machine. It's highly versatile, changing at a moment's notice from one kind of work to another... running from one location to the next at speeds to 29.5 mph... speeding both big jobs and small.

"D" can work in tight quarters and around obstructions that seriously interfere with other types of equipment. Its capacity is larger than that of an average dump truck, yet it will load itself, spread with its dozer blade to eliminate need for tractor, and travel places where a truck cannot go. And, with its open top, it can be used as a hauling unit for loading by belt, elevator, shovel, hoe, dragline, or clamshell.

Not only will D Tournapull handle these and a great variety of other jobs, but it will handle them easier, faster and with less manpower and auxiliary equipment than any other dirtmoving rig.

Tournapull—Trademark Reg. U.S. Pat. Off. DP-811-MU-z

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WESTINGHOUSE
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Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

ported on purlins spaced 3 ft. apart, to which they were fastened by "straw nails". End laps were sealed with mastic.

"Evaporation Losses and Algae Reduced in Aluminum-Covered Supply Reservoir". *Jour. AWW Ass'n*, September.

Sand-Anthrafil Used for Iron Removal

Frayser, Tenn., is testing for public supply a well water containing 3 ppm of iron. At first the treatment consisted of prechlorination, aeration and filtration through deep beds of anthrafil at a high rate. Iron passed entirely through the filter after about 5 hrs. operation, necessitating frequent backwashing. A series of experiments showed that when sand was used as filter medium, it would clog after 6 or 7 hrs. operation, but reduced the iron to 0.0 to 0.2 ppm. Tests with No. 1 anthrafil in various depths showed practically no loss of head and iron removal efficiency directly dependent upon the depth.

Combinations of sand and anthrafil were tried, and best results obtained from 30 in. of anthrafil on 30 in. of sand. Filter runs of 30 to 36 hr. were obtained when operating at the rate of 3½ gpm per sq. ft. Backwashing was made at a rate of 25 gpm per sq. ft. The plant, built to embody these features, has been in operation for over 6 months with very pleasing results; iron removal is excellent, and filter runs average 24 to 30 hr.

"Combination Sand - Anthrafil Media Provides Longer Filter Plant Runs". By Frank S. Rast, Jr., Manager of Utility Dist. Water Works Engineering, September.

Prevention of Freezing Of Pipe in Permafrost Ground

The construction of complete municipal services at Yellowknife, Canada, located in a region of permafrost, provided an ideal opportunity to study ground temperature around water and sewer pipes in such regions. Such a study was made by the Dept. of Health and Welfare and Div. of Building Research. The pipes were laid wrapped in a cover of moss, but this was found to afford little insulation because of absorbed moisture. Although moss on the surface afforded considerable insulation. The water supply is heated before being pumped into the mains, and the ground temperature is constant at several degrees above freezing for several feet above and below the mains and for less distances around

the smaller services. The data obtained were not sufficient to permit calculation of the amount of heat required in the water to prevent freezing, or the most economical depth at which to bury pipes.

"Protection of Utilities Against Permafrost in Northern Canada." By Stanley S. Copp, Carl B. Crawford and John W. Grainge, Eng'rs of the Departments. *Jour AWW Ass'n*, September.

Other Articles

"Automatically Controlled Pumps in Booster Stations" in Omaha, Nebr. Public Works, November.

"Algae Control With Copper Sulfate." A general review of the subject. By W. D. Monie, Chf. Engr., Portland, (Me.) Water Dist. Water & Sewage Works, September.

"Legal Aspects of Water Fluoridation." By John H. Murdoch, Jr., Chf. Counsel, Am. W. W. Service Co. Water & Sewage Works, September.

"Chemicals Dry Up Pump Pit Job" in Chicago, solidify the sandy soil. By C. Martin Riedel, of Chemical Soil Solidification Co. Engineering News-Record, Oct. 4.

"Water Supply Development in the St. Louis Area." A panel discussion by Charles M. Roos, Stephen C. Casteel, John B. Dean, W. Victor Weir and William B. Schworm. Ample supply of both surface and ground water. *Jour., AWW Ass'n*, September.

"Centralized Distribution System Control in the Washington Suburban Sanitary District." In 10 years' operation only minor troubles. By John M. Jester and John W. Henderson, Engrs. of San. Dist. *Jour., AWW Ass'n*, September.

"Automatic Control of Booster Stations in the Los Angeles System." Experience for 10 yr. with 53 automatic pumping plants" most satisfactory. By Marvin H. Owen, Mech. Engr., Dept. of Water. *Jour., AWW Ass'n*, September.

"Economics of Sludge Removal From Rectangular Basins at Chicago." in a double-deck parallel-flow structure. By Fred G. Gordon, Asst. Chief Engr. *Jour., AWW Ass'n*, September.

"Preparation of Engineering Reports for Management." By Bruce G. McCauley. *Jour., AWW Ass'n*, September.

"The Meter May Not Be to Blame" for pressure loss; tests using two-pen pressure recorders. By Joseph E. Young, Supt. Moorhead, Minn. *American City*, October.

"The Desalting of Brackish Water." Describes the Kuwait distillation system, using natural gas. By Rolt Hammond. *Water and Water Engineering (England)*, September.

"Water Supply for a Florida County." Pinellas Co. By C. E. Wright. *Public Works*, November.

"Safe and Effective Practices for Water Fluoridation Control." A manual on laboratory control. By F. W. Gilcreas, Prof. of San. Science, Univ. of Florida. *Water Works Engineering*, October.

Juneau County's Adams 660 grader digs drainage ditch, cuts sharply into topsoil and sandy clay. Grader worked this job at speeds to 6.7 mph, held blade to accurate cut.



"Does 30% more work,"
says commissioner

"You can't beat the '660,'" states Frank Cauley, highway commissioner for Juneau County, Wisconsin. "Our grader has done 30% more work in a given time than another make machine of the same size."

Juneau County uses its Adams "660" for rough and fine-grading, finishing shoulders, spreading gravel and oil-mix. Machine moves fast on all jobs, maintains steady pressure on blade, holds blade to accurate cut.

"I like the curve of the moldboard especially," says Operator Glenn Brown. "It always rolls material smooth and clean. Oil-mix does not pile-up, fall back over top of moldboard, or pile-up into the circle."

With power to roll heavy windrows of oil-mix at 6 to 10 mph, and to spread them evenly, the "660" is preferred whenever oil-mix is scheduled. On any windrow work, the 28" clearance under the "660" front-axle is a big advantage.

Cut ditches up to 6.7 mph

At the Albert Schultz farm, 2 miles southwest of New Lisbon, Wis., the "660" cut four drainage ditches to connect with a main canal. One ditch was cut 60 rods long, through a combination of sand, clay and topsoil. Grader cut to depth of 1½' and to width of 12', working in 4th gear at speeds ranging from 3.6 to 6.7 mph.

In winter, Juneau County uses the Adams-built snow-plow and wing attachment to clear snow-clogged roads soon after snow stops falling. Deep

drifts are pushed aside by sharp-angled plow while wing widens the cuts and levels the snow banks to prevent further drifting.

Speed range helps performance

Adams' range of speeds assures use of most effective power for handling any material. Standard "660" has 8 forward speeds, from 2.3 to 26 mph. Optional creeper gears can be installed for slower speeds ranging from 36' to 160' per min. for fine-finish work, added power in tough material, and working in confined areas. Adams 660 also saves time on shuttle work, with four reverse speeds ranging from 1.9 mph to 13.7 mph.

With an Adams, you can build, repair, and maintain more roads...keep surfaces smoother...handle service faster...keep tax-payers happier...do all this at a lower cost.

See an Adams grader work

Seeing is believing, so call or write for a demonstration. We'll be glad to show you how the "right" speed-power combination for every job can increase the output of your grader fleet. 6 models, 60 to 190 hp.

Adams—Trademark AG-9-P-z-6

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THE HIGHWAY AND AIRPORT DIGEST

Materials for Overhead Signs

In designing overhead signs, careful consideration must be given to the selection of materials and dimensions which will enable them to withstand high winds—70 to 100 mph in Ohio. The first signs used in that state were made of steel sheets in angle-iron frames. These were too heavy, and aluminum was used, but the cost was high. Next, plastic-surfaced plywood was tried and is still used for relatively small signs. Recently the Union Metal Mfg. Co. has developed simple structures made of steel tubes for supporting a number of signs, one over each lane. Also aluminum signs, strong, stiff and light are available.

In selecting the locations for an overhead sign, a planner should consider the design speed of the highway, number of lanes, traffic densities, complexity of maneuver, perception and reaction time of the driver, deceleration and maneuvering time necessary, vehicle speeds, distance from car to point of maneuver, length of message, and legibility distance of sign.

"The Overhead Sign, Its Development and Future for Traffic Control". By R. E. Holaday, Bureau of Traffic, Ohio Dept. of Highways. *Public Works*, November.

Mixed-in-Place Concrete Paving

An experimental concrete road has been constructed in California, by mixing in place, using a self-propelled Pettibone Wood Road-mixer to pick up the aggregates and cement from a windrow and place on the road a finished mixture of Class A concrete at a lower cost than by conventional methods. The windrow was placed at the rate of 10 cu. ft. per lineal foot, and was adequately mixed in a single pass. The roadmixer was followed by a vibrating spreader. It is thought to have been proved that this procedure gives a concrete with 10% greater beam strength than the state specifications require, with no ap-

parent trouble in maintaining uniform slump. There was no special segregation of aggregate and sand; and mixing rates in the 250-300 cu. yd. per hr. range were attainable.

"Mixed-in-Place Concrete Paving Method Shows Fast Production Possibilities". *Roads and Streets*, Oct.

Cement Stabilization of Cherts and Gravels

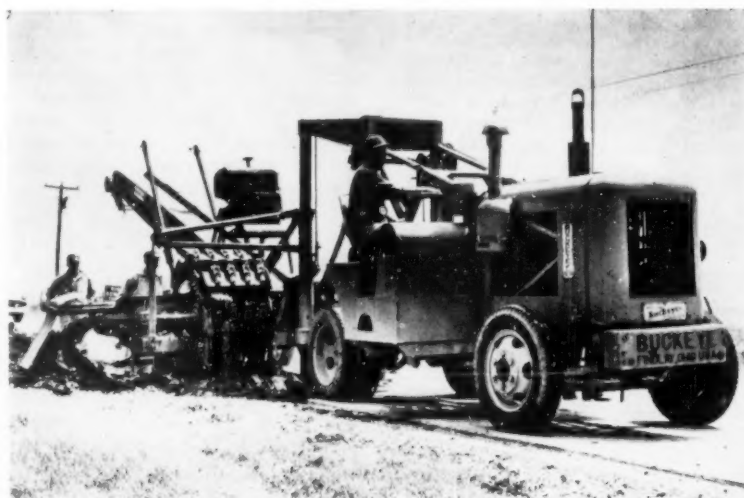
Cherts and gravels are common over wide areas of Tennessee, and other materials satisfactory for road building are not. For several years the Tennessee Highway Dept. has been conducting an investigation to learn how best these materials can be stabilized for use in road base construction. It was concluded that this was by use of portland cement at the low rate of 4 to 6%. In 1955 a chert base so stabilized was constructed 6.742 miles in length. The chert was spread 9½ to 10 in. loose depth, and cement spread at 75 lb. per lin. ft. of roadway 24 ft. wide. A mixer mixed this in one pass, and it was then thoroughly rolled with a

sheepsfoot roller in 6 to 10 passes, followed by a pneumatic roller. This base was covered with a double surface of slag and asphalt. The base cost 87¢ per sq. yd. The road to date has proved satisfactory.

"Cement Stabilization With Tennessee Cherts and Gravels". By E. A. Whitehurst, Director of Highway Research. *Public Works*, November.

Salt-Stabilized Pavements in Ohio

Some 25 miles of salt stabilized pavements were built by state forces in Ohio in 1955, and similar work is being done by contract in 1956. The objective is the reduction of maintenance costs on 260 miles of secondary low traffic roads. The existing surface is scarified 4 to 6 in. deep, pulverized, and additional aggregate and sodium chloride added, mixed, spread and compacted. Bid prices averaged slightly over \$3,500 per mile, including a bituminous prime coat. The salt was applied at the rate of 1½ pound per square



WIDENING STRIP is being excavated along Missouri State Highway 54, using a Buckeye trencher. Strips 30 inches wide are

being added on both sides of the road over a 13-mile section. Contractor was Trinidad Asphalt Company on this section.



TRANSPORTATION TRENDS



**White Trucks help modern business
save time . . . cut costs!**



HIGHWAY CONSTRUCTION and expanding building materials industries keep Autocar and White TRUCKS on the move. Bigger hauling jobs, too, because these husky trucks have the ability to do more work . . . reduce hauling costs. This big Autocar is owned by Buckley & Co., Philadelphia.

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PUBLIC WORKS for December, 1956



HOT ASHES from a municipal incinerator travel by White 3000—38,000 lbs. of them at a time. Ideal maneuverability of this modern tandem-axle White plus excellent weight distribution and rugged construction—all make it ideal for this specialized service.



STREET FLUSHING goes faster when you use a modern White 3000 with its maneuvering and driving ease. This unit is owned by the City of New Haven—one of a fleet of White 3000's operated by the Department of Public Works.



NEWEST truck for garbage collection is this White 3000 with latest packer-type body for extra efficiency, improved service and lowest operating cost because of functional design of these new Whites.

INSTANT BRUSH DISPOSAL FITCHBURG CHIPPER DOES 3 MEN'S WORK



Charles Morriss feeds roadside brush into Mahwah's Fitchburg Chipper.

When you want to cut brush disposal cost, investigate a Fitchburg Chipper, a real time and labor-saver.

John Glasgow, Superintendent of Public Works, Township of Mahwah, New Jersey, says: "Now I chip brush instead of putting it on piles and waiting for wet weather to burn. I mention wet weather because of fire hazard.

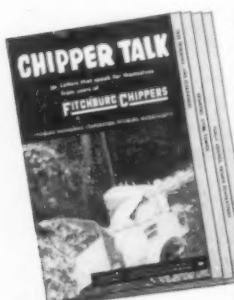
"The Fitchburg Chipper was purchased in May 1954. It will take only a short time to pay for itself. I hired 6 men to cut and clean up brush, now with the Chipper I only need 3 to do the same work."

You, too, can save man hours where there is a need for line clearance operations, road clearance, thinning out woodlots, or handling the brush problem on parkways, city streets, etc.

The Fitchburg Chipper is designed for rugged use, and in models priced from \$960 upward.

Learn about Fitchburg's exclusive spring-activated feed plate, which makes chipping of all sizes of wood (up to the machine's rated capacity) simple. Another exclusive feature is the hinged feed apron which can be closed when not in operation.

Read how others cut labor costs with a Fitchburg Chipper—the only chipper that gives you a one-year guarantee.



Send For New Free Booklet—"CHIPPER TALK"

Complete cutaway color drawings and photo copies of letters from many municipalities, commissions, counties, contractors, tree care men.

FITCHBURG ENGINEERING CORPORATION

Department PW-126 Fitchburg, Massachusetts

Send my free copy of "Chipper Talk" to:

Name _____ Position _____

Address _____

Town or City _____ State _____

yard per inch thickness of conditioned material and aggregate. The article describes the procedure in detail.

"Salt Stabilization of Pavements in Ohio". By J. W. Reppel, Eng'r. of Maint. *Public Works*, November.

Use of Local Materials in Iowa

The Iowa State Highway Commission has, since 1950, employed the Iowa State College Engineering Experiment Station to investigate the stabilization of loess, sand, and glacial till materials. Following laboratory tests, field tests are being made of stabilization with portland cement, lime, lime fly ash, and with organic cationic compounds. Another study is being made of methods of mixing asphalt with local materials. Nozzles for introducing the asphalt were studied, high-speed motion pictures (7,000 frames per second) were taken to study the dispersion of the asphalt, the shape and movement of the droplets. Results obtained indicate that a method has been developed for constructing low-cost, all-weather roads by using bituminous mixes containing local aggregates.

Studies are being made also of the movement of moisture through soils due to temperature differences, capillary forces, and to flow of electricity; and of prestressed concrete slabs.

"How One State is Tackling Its Local Material Problems". By John H. Bolton, of Iowa Engineering Experiment Sta. *Roads and Streets*, October.

Renting Contractors' Trucks for Snow Handling

The Connecticut State Highway Dept. in August, 1955, for the fourth year, advertised for bids from truck owners for machines to help with snow handling between Nov. 1 and April 15. During this period the trucks, with driver and a laborer, must be available at all times. Each truck is assigned to locations within 25 miles of the owner's garage and must appear on the job within two hours after notification. A 4-hr. minimum work period is guaranteed. During the winter of 1955-56, one district hired 22 trucks for a total time of 7272 hours at a cost of \$78,-259.20. The total paid by all districts was \$293,000, at prices ranging from \$7.50 to \$10.00 per hour; including driver, laborer and operating cost.

"How Rented Snow Trucks Help Ice and Snow Work". By James W. Maher, Eng'r of Maint. *Roads and Streets*, October.

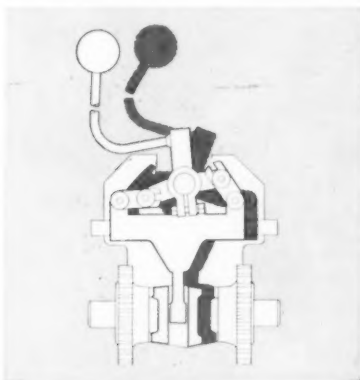
Report from the Dallas-Fort Worth Turnpike Job



"The Allis-Chalmers Forty Five motor grader has the

BEST CONTROLS I'VE EVER TOUCHED"

That's what veteran motor grader operator R. C. Fryer of Telephone, Texas, says about the new mechanical, toggle-type control levers on the Allis-Chalmers Forty Five motor grader he is operating for the J. C. Watson Construction Co., Dallas, Texas.



FORTY FIVE
120 brake hp • 23,800 lb

And here's why Fryer is so enthusiastic. Toggle-type controls move gears into operating position surely, quickly when operator moves lever . . . but with *no* wrist-snapping kick-back. Levers stay put—can't fight back. With no backlash to worry about, Fryer does precision jobs faster and easier.

You've got to see it to believe it

R. C. Fryer is a veteran of the four-mule Fresno days, and his enthusiasm is proof that the Forty Five is motor grader news worth looking into. Check and you'll find toggle-type controls are only one of many features that mean new performance and new operating ease.

The big Allis-Chalmers diesel

engine provides real lugging ability. The **ROLL-AWAY** moldboard rolls the load instead of pushing it . . . moves it faster with less effort. Fully enclosed power steering, new accelerator-decelerator pedal, real operator comfort, excellent visibility, all add up to the kind of production and long-life service you want.

See the Forty Five. Try the Forty Five. Find out for yourself the many advantages that will help you get top performance and big production on your jobs.

Your Allis-Chalmers dealer has complete facilities to serve you—factory-trained sales and service personnel, factory-approved service equipment and complete stocks of True Original Parts.

ROLL-AWAY is an Allis-Chalmers trademark.

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ALLIS-CHALMERS



An Unusually Complicated Traffic Circle

An unusual traffic control problem is presented in the city of Paris, France, where 12 avenues lead into one traffic circle at the Place de l'Etoile. Traffic on each of these avenues ranges from 4,500 to 24,000 vehicles per day, with peak volumes exceeding 4,000 per hour; and the total number entering the Place averages 110,000 per day, and reaches 20,000 per hour. To control this traffic, three signals are placed at the junction of each avenue with the outer ring, and two on each side of pedestrian crossings. The article describes these in detail.

"Traffic Signals at the Place de l'Etoile." By A. Herzog, Asst. Director of Tech. Services, Paris. *The Surveyor*, Oct. 13.

Piles for Highway Bridges

The Virginia Dept. of Highways uses four types of piles in the foundations of its highway bridges—timber, cast-in-place concrete, precast concrete, and steel H-piles. Timber piles are those most widely used. Where underground and entirely below the permanent water table, they are not treated; for permanent use under other conditions, they are treated with creosote oil in accordance with AASHTO standards. Concrete piles are used for greater permanence under certain conditions, but not where they could be exposed to salt water. They are generally driven to twice the bearing capacity of wooden piles. Steel H piles are frequently used where they can be driven to rock. Timber piles are normally driven to a bearing capacity of 20 tons; cast-in-place piles are driven to a capacity of 45 tons for 16 in. diameter or 35 tons for 12-in. Steel H-piles are designed for a bearing capacity of 6,000 lb. per square inch of cross-section.

"Use of Piles in Virginia Highway Bridges." By J. N. Clary, Bridge Eng'r of Dept. of H'ways. *Public Works*, November.

Effect of Road-Unit Size on Cost of Rural Roads

A research has been conducted jointly by several Illinois authorities on the effect of size of road administrative units on the costs of maintenance, administration and construction of rural roads. It is reported that the greatest economies occurred in the mileage increases in the lower ranges; there was an average reduction of 10.8% in per

mile maintenance cost between 20-mile and 30-mile administrative units; and 6.4% between 30 and 40-mile units. Administrative costs were less by 17.9% in the former range and 12% in the latter. Construction costs per mile of each kind of construction decreased as the size increased.

Prof. John E. Stoner suggests that several counties program their construction work together, so that all could advertise projects of similar work at the same time so that the combined amount, constructed consecutively, would occupy a large part or all of the construction season for one contractor, who could therefore afford to bid lower than for small unrelated jobs.

"Effect of Road-Unit Size on Cost per Mile of Road."

"Should Counties Combine Projects for Bid?" By John E. Stoner, Prof. of Government, Indiana Univ. *Better Roads*, October.

Treated Timber For Highway Bridges

Advantages of using pressure-treated timber for highway bridges include ease of handling and installation; short time required for installation; low cost; durability (a life of 30 yr. or more, after which the bridge probably will be inadequate because of increasing traffic); and ease of salvage. Round wood piles, debarked, are recommended for foundations. In most cases an

ordinary pile driver is sufficient for placing piles; but in sand subject to scour, deep penetration can be obtained by a combination of driver and jet pump. Caps on pile bents can be of either sawed timber or concrete. For the deck, treated wood stringers and floor are commonly used, covered with a protective wearing surface—asphalt or sand-clay. If the floor is not protected, use of black gum or oak for floor boards is recommended. A longitudinal laminated deck eliminates the need for large stringers; sometimes a timber-concrete composite deck is used. For long spans, steel beams and wood floors can be constructed quickly. Also "glulam" beams are feasible for long spans, being laminated beams glued together with water proof glues. These have been used for spans ranging from 30 to 75 ft. If creosote or other oil is used for wood preservation, the beams must be glued up before treatment; but if water-borne salts are used, the wood can be treated before gluing.

"Utilizing Pressure-Treated Timber in Construction of County Bridges." By W. A. Stacey, of American Wood Preservers Institute. *Better Roads*, October.

Number of Motor Vehicle Registrations

According to the Bureau of Public Roads, the numbers of registrations expected to be reached in 1956

Forms for Curbing and Parapet Walls

SPECIALLY DESIGNED forms for curbing and parapet walls are lowering construction costs and saving time on two of the most complicated sections of the new multimillion dollar San Francisco Freeway System.

The Blaw-Knox forms constructed of 3/16-inch steel are rigid, and equipped with screw jack and lap plate adjustments to allow for both vertical curvature and super-elevation. The five-foot lengths, bolted together, create a sweeping curve, conforming to the contours of freeway construction without resorting to curve sections. The particular forms used on the freeway project provide for 9-inch curbs, topped by an offset, two-foot parapet wall.

The forms represent a saving of time in forming and facilitate the stripping operation. An additional feature which makes for ease of use is the absence of tie rods through

the concrete. The curbing and wall plates are connected with cantilever bars which clear the top of the concrete surface with several inches to spare.



are: Passenger cars, 54,300,000; truck and bus, 10,975,000. Florida's registrations increased 8.7% over 1955, the highest percentage of any state. Arizona is next with 8.5% increase, and Nevada follows with 8.4%. It is expected that registrations will reach 81,000,000 by 1965.

"Motor Vehicle Registrations." *Better Roads*, October.

Other Articles

"Pittsburgh Plans Arterial Highway Routes". By Joseph Barnett, Asst. Deputy Com'r., B.P.R. Civil Engineering, October.

"How Cities Are Shaping The Urban Framework to the State Highway Plan." Maps, with descriptions, of 8 cities and the highways through and around them. *American City*, October.

"Factors in Road Maintenance" in Douglas Co., Washington. By Pat Thomson, Co. Engr. Public Works, November.

"Traffic Rotaries; Yes or No." Generally satisfactory in Edmonton, Canada. By A. J. Mair, Public Works, November.

"Oversize Crushers Solve Troublesome Limestone Problem for Kansas Turnpike." *Roads and Streets*, October.

"Design Standards for Interstate Roads." Policy endorsed by AASHO. By Duane L. Cronk, Editor, *Roads and Streets*, October.

"Influence of Upgrades on the Economics of Road Construction" and traf-

fic costs. By A. Schuhl, Chf. Eng., Roads & Bridges, France. *The Surveyor*, Oct. 6.

"Engineering Management in County Highway Operations." *Better Roads*, October.

"Access Control One Way of Restoring Traffic Stability;" successful in Texas. By D. C. Greer, State Highway Engineer. *Better Roads*, October.

Oxidation Ponds and Radioactivity Removal

OXIDATION PONDS can concentrate, delay and remove many of the radioisotopes frequently found in dilute wastes, according to some recent findings of the University of Texas Balcones Research Center. The detention periods of oxidation ponds are relatively long, providing ample opportunity for radioactive decay, coagulation, and sedimentation, incorporation into biological cells, and redilution.

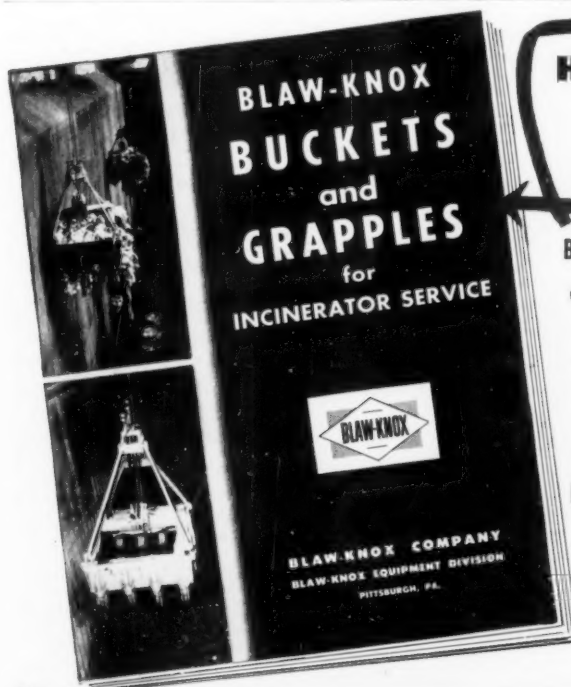
In the case of short-lived radioisotopes, oxidation ponds are ideally suited to detain and dilute radioisotopes. Long-lived radioisotopes present a greater problem, but as a rule most isotopes enter

into some chemical or biological reaction whereby the isotope detention is considerably longer than the mean flow through time, resulting in a considerable dilution factor.

Decontamination of radioactive waste water, by algae uptake, depends in part upon the efficiency with which algal cells can be separated from the water. Unfortunately, the size, range and nature of the free floating algae make them very difficult to concentrate by the usual separatory methods, including pressure filtration and mechanical screens. Rotary vacuum filtration of algae suspensions, however, was an effective separation method.

Chemical precipitation with iron and alum coagulants is possible, and the costs of removal and subsequent filtration of the resulting sludge is less than that of vacuum filtration alone, but only about 90 percent of the algal cells are removed from the liquid suspensions. Other methods of algae separation are presently under study.

Dr. E. F. Gloyne, of the University of Texas Civil Engineering faculty, directs these studies, which are sponsored by the Atomic Energy Commission.



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BLAW-KNOX INCINERATOR BUCKETS AND GRAPPLES

The Story behind the New SNAP-TOGETHER CLAY PIPE JOINT

EVERYBODY agreed — it was a tough sewerage job and a tough test of any sewer line. The place was Liverpool, N. Y., and the pipe was Robinson's plastic-jointed Wedge-Lock Clay Pipe. The trench cut through an area of yielding gravel and quicksand. Much of the 8-inch line was completely submerged in two and a half feet of water when completed.

O'Brien and Gere, the consulting engineers, had specified allowable infiltration of 175 gallons per inch of diameter per 1000 feet of line per day. For a test, a 290-foot section of the submerged pipe was plugged for 14 hours. To the surprise of the contractor and the engineers, when the plug was removed the line was dry —infiltration was zero.

The test had climaxed nearly 30 years of experimentation with sewer pipe jointing, and it was especially significant for Robinson. Long a pioneer in clay pipe research, The Robinson Clay Product Co. is celebrating its 100th anniversary this year. They started work on the jointing problem in 1928.

Initial explorations indicated the need for a factory pre-fabricated joint that would meet the following qualifications: (1) resistant to corrosive agents, both chemical and bacterial; (2) resistant to deterioration and dimensional change while in storage and shipment; (3) flexible enough to withstand vibration and trench settlement; (4) reasonably simple and inexpensive to manufacture; (5) permanently infiltration-proof; and (6) easy and inexpensive to install.

In the late 1930's, the first factory prefabricated joint for clay pipe was put on the market, a pre-cast asphalt design which became known as a "slip seal." It consisted of two conical mating surfaces formed on the bell and spigot ends of conventional clay pipe. These were painted with an asphalt solvent, and the lengths were shoved together. It held together well and effectively resisted infiltration and exfiltration, but it lacked the flexibility necessary to resist heavy vibrations and shifting trench bottoms.



● HOW the joint looks after bell and spigot ends are pushed together.

It was not until another ten years had passed that Robinson engineers discovered a material which seemed to meet their requirements. This was a new plastic development called polyvinyl chloride plastisol. When heat cured, it was as flexible as rubber. Further experimentation discovered an adhesive which would bond the plastisol to salt glazed vitrified clay pipe.

Initially, it was decided to produce an experimental plastisol joint utilizing the thread and collar principle. This jointing method had the advantage of extreme tightness, giving the line maximum resistance against tension and pull-out forces. A joint of this type would meet all requirements except one: it presented some serious installation difficulties. Since installation does not pose such a serious problem in pipe designed for industrial uses, the new plastisol joint, called "Screw-Seal,"

was produced for industrial applications.

By 1954 the first products for bell-and-spigot sanitary sewer lines were being tested. Cast on the spigot end of the new Wedge-Lock Clay Pipe was a solid, smoothly curved ring of plastisol. A mating ring of the same material was cast inside the bell.

When Wedge-Lock lengths are pushed together, the solid spigot ring "pops" into the bell opening, seals shut with a positive locking action, and provides a permanent, leak-proof joint. Because of its flexibility and double-ball-joint action, Wedge-Lock pipe can be laid in uneven trench bottoms without disturbing the seal. Backfill can be applied immediately without loosening the bond. Wedge-Lock remains permanently sealed even when installed under the most difficult trenching conditions. In many cases it has cut the time and cost of installation in half. Root penetration has been effectively thwarted by the Wedge-Lock joint.

Today, eight years after Robinson engineers launched their first experiments with PVC plastisol, Wedge-Lock pipe is offered in diameters of 4 to 15 inches, complete with fittings for all sizes, and in lengths up to five feet.



● PIPE lengths, it is said, can be pushed together by hand, a one-man operation.



Set your sights on an Allis-Chalmers HD-6B



built for business on both ends

Here's what Roy Worthington, Hermitage, Missouri, says about his HD-6 with hydraulic bulldozer and rear-mounted ripper:

"More yardage per day." Production moves fast when this HD-6 team digs in. A rear-mounted hydraulic ripper plows through rock and dirt, loosens it for faster, more efficient dozing on this quarry exploration job.

"Better maneuverability." On steep hillsides or in rocky ravines, the HD-6 with 15,850 lb and almost 7 ft of track on the ground, keeps sure-footed balance. Fast-acting controls, easy shifting and full visibility put the operator in full command of his work at all times.

"Smooth-running, constant power." This is what Roy Worthington said about the 63-belt-hp

Allis-Chalmers diesel engine. It delivers power for big output and has ample reserve. Stripping topsoil or digging ponds, the HD-6 is powered for more production, lower job costs, longer life.

"Simplified maintenance." Worthington's operator can leave his grease gun home for one to two weeks because the shortest lubrication interval is a full 75 hours! What's more, the HD-6 has 1,000-hour lube intervals on truck wheels, support rollers and idlers. This eliminates daily greasing, converts maintenance time to production time.

"Excellent service." Owners know how Allis-Chalmers construction machinery dealers work with them to keep their Allis-Chalmers equipment in tip-top shape. See the dealer in your territory soon. He'll be glad to tell you more about the HD-6 and show you one at work.

HD-6B
52 drawbar hp
63 belt hp
15,850 lb

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ZONING

at the County Level

LAND AND THE structures upon it are the cause of traffic generation. Every separate parcel of land is the point of both origin and destination of traffic, to a greater or lesser extent, depending upon the use of this land.

The relation of highways to land use districts is somewhat similar to the relationship between a river and its water-shed. Just as the amount of vegetative cover and the intensity of rainfall determines the run-off from the watershed, so does the type and intensity of land use relate to the volume of traffic which we may expect to funnel onto a highway.

Zoning is essentially the regulation of the use of land in the interest of public health, safety and welfare. It is the legal instrument, whereby a municipality may not only regulate, but encourage the development of land in accordance with a long-range comprehensive plan. All public facilities should be related to the areas and to the population which they must serve. School buildings, parks, playgrounds, sewer lines, disposal plants and public water facilities are all affected by the manner in which private development of land occurs. Amenities, such as light, air and privacy, should also be the goal of good zoning.

Good zoning assures the homeowner of a certain stability in his neighborhood. Those of us who live next door to a vacant lot will not have to lie awake at night worrying about the erection of a gasoline station or an industrial building, if we know that we reside in an area protected by residential zoning.

The situation in Allegheny County is perhaps typical throughout the country. We are saddled with the fact that our County is composed of 129 separate municipalities, consisting of one second class city, three third class cities, 79 boroughs, 23 first-class townships and 23 second-class townships, each with the power to do long-range planning and

This is part of a paper by Robert L. Horne, Assistant Chief Engineer, Bureau of Projects and Surveys, Allegheny County Department of Works, Pittsburgh, Pa., at the National Highway Conference of County Engineers and Officials, Mackinac Island, Michigan.

to adopt zoning ordinances. At last count, 90 municipalities in the County had adopted zoning ordinances. However, of these 90 only 12 were based on comprehensive long-range plans. So, in our situation, we have 78 municipalities which have placed the "Cart before the Horse." They have drafted zoning ordinances by the "Seat of their Pants." They have established lot sizes without any study or thought given to the effect that population density will have on municipal services.

But perhaps the worst defect is the lack of zoning co-ordination among the multitude of municipalities, all of which comprise a single urbanized area within Allegheny County. Physically, there is little difference to be noted when passing from one municipality to the other. The lack of co-ordination among the many municipalities has resulted in some cases of industrial districts on one side of the line dividing two municipalities abutting residential districts on the other side of the line.

Enforcement of zoning ordinances among municipalities is not very uniform. When a real estate promoter enters the scene and attempts to get an amendment to the zoning regulations in one municipality so that he may put up a shopping center in an area zoned "residential", he might be stopped through the alertness of a particular Board of Adjustment or Borough Council. However, the promoter may step over the line into an adjacent municipality and achieve his aims within what is the same geographical area,

simply because he finds more pliable municipal officers who are willing to succumb to the temptation of new tax ratables, without any consideration for the capacity of existing highways or streets which carry traffic or the discomfort to near-by residents entailed by the activities that go on in shopping centers.

Zoning is a complex technical field requiring the services of people trained in the field of community planning. At the county level, we do have a Planning Commission which is empowered to make studies and plans relating to the long-range development of the county, but without the power to zone.

Short-sighted, local officials, in many places, have put out wholesale invitation to gas stations, dairy and other types of bars, in motels and the like along the major highways, which in most instances, have been built by either the County or the State. Not only are they permitting such atrocities to occur, but they have destroyed the abutting land for residential use by freezing the area in commercial zoning.

One of our most pressing problems of zoning in Allegheny County is the disposal of garbage and refuse. We all like to stay as far from such facilities as possible, but we are reaching the point where refuse collecting companies are hard-put to find disposal areas, due to the exclusion of such activities from most of the municipalities which have enacted zoning ordinances. The burden, therefore, falls upon those few remaining communities that do not have zoning ordinances. However, it is just a matter of time until they too, catch up with the gang and exclude such activities. We are then going to be faced with the unpleasant necessity of dumping our garbage in the neighboring counties.

Our County Planning Commission is now engaged in a comprehensive study of industrial sites. Because of our peculiar geography and topographic situation, industrial sites are somewhat at a premium. Involved in this study is a close examination of the 90 separate zoning ordinances previously mentioned. One trend that appears to be emerging, is the attempt on the part of many municipalities to exclude industry from their boundaries. This reduces substantially the amount of land which we will have available for industry, the economic "life-blood" of our region.

The instances of new shopping centers destroying the effective traffic carrying capacity of our high-

ways are innumerable. It is a strong temptation for a local Borough Council to grab at any offering in the way of tax-ratables without considering, not only the effect in the immediate area, but also on the major highways, often built by the other levels of Government, such as the County and State, and which carry traffic through and beyond the immediate vicinity. For example: We are now engaged in adding the fourth lane on a major highway which has been effectively destroyed by a large shopping center. Traffic lights have been installed along the length of several miles on a highway, which, not more than a decade ago was posted for 50 mph. Speed limits now have been reduced along this particular road to 35 mph. This choking influence of unrestrained ribbon-commercial development can be laid directly at the door of the local municipal officers, who have exercised no foresight in their zoning policies.

This particular example has made it necessary for the State Highway Department to consider the construction of a parallel bypass road around this area which has been blighted by unrestrained commercial growth—this at a time when the construction of an additional traffic lane has not yet been completed. I think we can all understand the duplicity and waste of public funds occasioned by lack of co-ordinated zoning in the whole of an urbanized area.

Realizing that the drafting of zoning ordinances is but one phase of a total county planning program, let us briefly summarize the facts relating to official planning agencies in county government, out of a total of 174 urban counties throughout the country, having a population of 100,000 or over, 91 counties, or 52 percent report having official planning agencies and, what is more significant, 77 counties or 44 percent of the total have full time professional planning staffs. It is also reported that 70 counties or 40 percent of the total have zoning ordinances adopted at the county level. I am sure that many more zoning ordinances would be enacted at the county level, were it not for the fact that the necessary statutory authority has not been granted by many states.

The townships in Wayne County (Detroit) enact individual zoning ordinances. However, before an ordinance be enacted, it must be approved by the Zoning Co-ordinating Committee of the Board of County Supervisors.

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More snow control officials use the "Scotchman" for chemical spreading than any other kind! Reasons: It's **Faster**. It's more **Convenient**. It pays its way in savings of **Time, Labor and Materials**. Ask your dealer or write for details.

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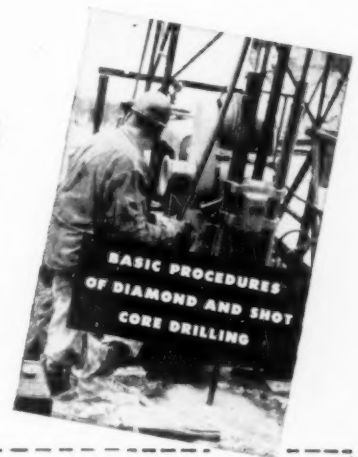
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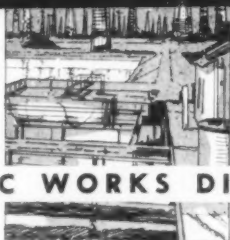
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PUBLIC WORKS DIGESTS

THE INDUSTRIAL WASTE DIGEST

Fundamentals of Air Sampling

Airborne contaminants may be classified chemically or sorted into two major groups depending on whether they contain living matter. The forms in which contaminants are found in air are as dusts, fumes, gases, vapors, and mists. Ordinarily, dust particles smaller than 10 microns in size are of public health significance. Fume particles produced from condensation of solid substances vaporized by heat are generally smaller in size than dust particles. Air is sampled for purposes of process control in industry as well as in the interest of health and often both purposes can be served by interchange of information. The toxicity of a contaminant is not always easily determined because of varied human reactions and differing rates of breathing. Air sampling data are valuable in a negative form as well as positive since it is important to know what is safe, also. Extremes of exposure are important. The relation of the length of the operating cycle to the time involved in sample collection is necessary in evaluating average exposure. Particulate matter is usually collected on some type of filter. Gases may be absorbed in a collecting liquid. The preferred instrument is one which gives an on-the-spot answer. Color reactions in chemical tubes are usually immediate. Recording devices are employed to show fluctuations and provide permanent data for air conditions.

"Some Basic Principles and Problems of Air Sampling in Industry." By Charles D. Yaffe, Public Health Service, Cincinnati, Ohio. *Public Health Reports*, September.

Pilot Plant Study of Corn Products Wastes

The waste components from the Bluebonnet Plant of the Corn Products Refining Co. of Corpus Christi, Texas result from wet milling of grain sorghum for production of starch and related products. A pilot plant was established to study the

application of a trickling filter as a treatment method. The pilot plant consisted of two trickling filters in series preceded by an equalization tank and followed by settling tanks. The pH was adjusted to between 6.5 and 8.5 with soda ash. "Aero-Block" was used as filter media. The BOD of the waste ranged from 500 to 2000 ppm; pH was predominately on the acid side; and the waste was deficient in nitrogen and phosphorous. BOD loadings of 4 lbs. of BOD per day per cu. yd. were obtained. Feed rates of 0.25 and 0.5 gpm were studied with recirculation ratios of 5:1 and 10:1 used. BOD reductions of 94 percent were obtained with the 5:1 recirculation ratio at both rates of application, with improved results with a 10:1 ratio.

"Treatment of Wastes from a Corn Industry by Pilot-Plant Trickling Filters." By R. Hatfield and E. R. Strong. Southwest Research Institute, San Antonio, Texas and F. Heinsohn, H. Powell, and T. G. Stone. Corn Products Refining Co., Corpus Christi, Texas. *Sewage and Industrial Wastes*, October.

Chromium Reduction in Auto Plant Waste

The Ford Motor Co., in locating an assembly plant at Mahwah, New Jersey, recognized the need for a high degree of waste treatment to help maintain the stream quality of the Ramapo River, subject to extensive domestic and recreational use. Consequently separate treatment plants were installed for sanitary and industrial wastes. The sewage treatment plant involves the use of a high rate trickling filter (20 mgad) and effluent chlorination. The industrial wastes are segregated into relatively clean wastes and those receiving pollutants. The latter contain paint pigments and oils, detergents from washing, hexavalent chromium, and caustic. These flow into a holding tank where the wastes are drawn off into a batch treatment tank. The chromium is reduced to the trivalent form by sodium metabisulfite in an acid solu-

tion (pH of 3) after flocculation of the waste with ferric chloride and sulfuric acid. After the reduction has taken place, the chromium is precipitated with lime. The supernatant from the treatment process is discharged to the outfall sewer.

"Waste Treatment at an Automobile Assembly Plant" By Edward R. Grich, Ford Motor Co., Mahwah, N.J. *Sewage and Industrial Wastes*, October.

Ozone for Phenol Reduction

Oxidizing phenols in petroleum refinery wastes is possible by using ozone generated at the plant site. Welsbach ozonators, which pass air under pressure through a high voltage discharge, convert about one percent of the through-put air to ozone. Phenolic liquors absorb and react with ozone rapidly and simple gas-liquid contacting devices such as sieve plates or porous stainless steel or carborundum plates may be used for dispersion of the ozone. The reaction takes place at any pH value but is enhanced at the higher values. This is offset, however, by air increase in the rate of decomposition in the higher pH ranges. The average ozone requirement for a wide range of wastes has been about five parts of ozone per part of phenol. Ozone treatment adds only oxygen to wastes and the characteristics of the wastes are not changed otherwise. A reduction in BOD and COD accompanies phenol destruction. Odor and toxicity due to phenols are likewise reduced.

"Ozone Method for Destruction of Phenols in Petroleum Waste Waters." By S. J. Niegowski, Welsbach Corp., Philadelphia. *Sewage and Industrial Wastes*, October.

Atomic Energy Plant Wastes

The largest volume of wastes from the atomic energy industry has a low level of radioactivity and includes sink drainage from laboratories, wastes from laundering garments used, and reactor-cooling

Largest floating cover digester installation on the West Coast—San Francisco's North Point Sludge Treatment Plant



At San Francisco, California . . .

10 P.F.T. Floating Cover Digesters installed to gain "Controlled Digestion" advantages

In operation since 1952, this modern plant has a digester capacity of 2,451,000 cubic feet, and handles sewage sludge for a population of 1,169,000. The plant was designed and equipped to effectively control action in the digestion tanks, and to efficiently utilize the large volume of solids.

There are two batteries of five digesters, and a control building for each group. All ten digesters are equipped with 100' diameter P.F.T. Floating Covers for positive scum submergence and safe utilization of gas. The snug-fitting P.F.T. covers eliminate odor problems—an important consideration in this installation because of a residential area close-by. Gas collected under the domes is maintained at constant pressure under all operating conditions, greatly reducing explosion

hazards. Capacity is highly flexible, because no fixed levels need be maintained; covers simply rise or lower with additions and withdrawals.

Housed in the control buildings are a total of eight P.F.T. #1500 Digester Heaters and Heat Exchangers, equipped with automatic controls. These heaters—using sludge

gas as fuel—maintain constant digester temperatures, and also heat the control buildings. Rated heater output capacity is 12,000,000 B.t.u./Hr. Other P.F.T. equipment at this plant includes P.F.T. Floating Cover Position Indicators, and a full complement of P.F.T. Gas Safety Equipment.

*Design of
plant by / Engineering office
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NEW KELLY-CRESWELL SPRAY GUN MAKES ROAD STRIPING EASIER



Kelly-Creswell Company, Xenia, Ohio, recently announced the introduction of a new automatic striping gun (shown above) for use on highway and industrial road-marking equipment. Gun is Patented.

This new gun is diaphragm-operated, which eliminates the air cylinder and upper packing gland normally found in most spray guns. As a result, it eliminates the greatest cause of air loss in automatic spray guns. The new gun requires about 25% less compressed air to operate at peak efficiency.

The gun is being installed on all of the various types of striping equipment made by Kelly-Creswell. It also is available as a replacement part.

Kelly-Creswell is a pioneer manufacturer of a complete line of road-marking equipment—truck-mounted, power driven and hand operated.

For additional information write
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Xenia, Ohio

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waters stored and monitored before discharge. High-level wastes may be concentrated by evaporation, ion exchange or co-precipitation and stored in underground tanks. Others may be enmeshed in concrete and dumped at sea or buried. Studies were conducted by the Public Health Service on the Columbia River where reactor cooling wastes from the Hanford Works are discharged to determine the effects of radioactive materials on the physical, chemical and biological characteristics of the receiving stream. In sampling and analytical work, the usual BOD, dissolved oxygen, and coliform analyses are of less significance than those for metal ions and toxic components. Location of sampling points and techniques must take into consideration the amounts and characteristics of radioisotopes present. Major considerations from the standpoint of aquatic life are water temperature variation, chemical toxicity and the accumulation of radioisotopes in aquatic organisms. While present indications are that the bulk of the wastes from nuclear energy institutions will continue to be of low-level activity and results so far indicate that on the Columbia River, at least, there have been no observable effects on stream chemical, physical and biological characteristics.

"Radioactivity in Stream Pollution." By R. C. Palange, G. G. Robeck, and C. Henderson, R. A. Taft, Sanitary Engineering Center, Cincinnati. *Industrial and Engineering Chemistry*, October.

Industry Wide Textile Waste Reduction Possible

Many investigations in the past have shown the extreme variability of the nature of textile wastes, but little attempt was made until 1949 to correlate data with production information such as type and weight of cloth involved, processes and chemicals used and volume of waste discharged. In that year the New England Interstate Waste Pollution Control Commission commenced an investigation into the various sources of pollution in the manufacturing processes. It was found that the processing of grease wool and Dacron (when using benzoic acid, salicylic acid, or phenylmethylcarbinol) produce the greatest BOD loads. Cotton, Orlon, and Dacron (with ortho-phenyl) are next in order. BOD loads are produced from natural impurities in the fibers and process chemicals used. Adequate reduction in BOD loads may be obtained through sub-

stitution of low-BOD chemicals for those in normal use. A nucleus of a master list of substitution chemicals has been started, but a full-time research group should be established, directed by a Committee of textile chemists, engineers and manufacturers. It is expected that the textile industry as a whole can quickly reduce its pollution load by 40 to 60 percent through chemical substitutions and 70 to 90 percent eventually.

"Pollution Reduction Program for the Textile Industry." By Joseph W. Masselli and Gilbert Burford, Wesleyan University. *Sewage and Industrial Wastes*, October.

Transformation of Carbonaceous Material

For every carbon compound formed in nature there exists some microbial agency for its decomposition. While vast accumulations of aromatic compounds—lignin, coal and petroleum—have survived decomposition, these compounds have been removed from an aerobic environment to one that is anaerobic. In studying the decomposition of lignin, much of the confusion has arisen as a result of technical deficiencies, but investigations may now be carried out using a native lignin closely approximating the quality found in nature. The mechanism of microbial decomposition of a carbon compound is that of enzymatic action. In view of the specificity of enzyme action, it seems that a synthetic polymer would not likely be attacked by existing enzymes unless a great similarity existed between the synthetic and natural material. However, there is some evidence that unnatural substances can induce adaptive enzyme formation in micro-organisms. The degradation of cellulose in bodies of water is apparently brought about by extracellular enzymes released by anaerobes. The action of hydrolytic enzymes secreted by the microbial cell causes the depolymerization of a variety of large molecules. Cellulose is hydrolyzed by cellulase, chitin by chitinase, starch by amylases. By calculated adjustment of feeding and starvation phases, a microbial population has been enabled to dispose of large amounts of dairy waste without proliferating so as to necessitate the removal of cell debris as sludge.

"Transformations of Carbon Compounds by Microorganisms." By Walter J. Nickerson, Rutgers University. *Industrial and Engineering Chemistry*, September.

MAKE IT EASY FOR THE NEW MAN

MANY A POTENTIALLY good employee is ruined by getting off to a bad start. Far too frequently we concentrate all our thinking for him in the field of how to do his work, but we give no attention to a number of other problems he has to face in becoming adjusted to his new job.

Education in practical work detail is a necessary step, of course; but it is far from the only one that should be taken. Here are some of the problems that a man faces when he joins a new staff. All of these problems should be recognized, not only the how to do it factor.

Sometimes the new employee is just plain scared. Fear isn't always a cowering in terror; it has variable degrees. Usually it exists in such minute quantities that it is indiscernible; but is present in almost every new employee's make up. The fear of doing something wrong; of making mistakes; of displeasing the new employer; and others of like nature are usually present. Allowances for them must be made in handling the new man not only by the executive but by every other individual with whom he will associate.

Uncertainty of his position is present in almost every case. A new man can never be sure how other employees feel about him unless such uncertainty is removed at the very start. Part of his first day indoctrination should be to make his position on the staff clear and without question. He should be assured that he has been hired to the specific job with full standing as a member of the staff. All routines should be given in either verbal or written form (preferably the latter). If he must learn these by actual practice they will reduce his work efficiency until all have been discovered. The more such details connected with the routine of his job can be clarified before he actually starts work, the more at ease he will be; that provides assurance that his maximum abilities can be exercised from the very start.

In some instances such routines are presented through actual job experience and take a long time learning. This not only retards the employee's self assurance on his job but in many cases the absence of such information results in costly mistakes. Relaxing work pressures



during the early period has also been found to be helpful.

It has been found good procedure to exempt all new men from bonus plans, contests and similar incentives drives for the first month or more that they are on the job. This gives the individual the opportunity to build his own self assurance without pressures immediately to attain work levels enjoyed by the well established men on the staff; a difficult thing for any new man to do no matter how good he may be.

Let him know that records are not expected of him during his first weeks on the job. Most employers have a habit of keeping close supervision over the results new men are obtaining. Usually the men are very much aware that this is being done. Such a procedure can often do more harm than good in any organization. Even where this is not done, the man may feel that such outstanding results are expected of him from the very start.

Lonesomeness can also have a demoralizing effect. Usually there is at least one member of the staff possessing the special gift of friendliness that can be invaluable in helping him to get started. As a rule no more than a single first week is necessary to reduce such lonesomeness which, with some individuals, can have a decidedly adverse effect. In some cases only a day or two of such companionship will be necessary. Whatever period of co-operation or supervision is decided upon it is most advisable that no employee ever be put on the job "all alone" for at least the first week.

Introduction to other individuals in his own department and in other departments with whom he will

have to work is also an advisable step to take in starting the man off on the right foot. Where the individual's work requires that he have the active co-operation and support of others, this will mean that the new employee can reach top work efficiency much sooner than if he is forced to make these initial contacts on his own. It can mean reaching top efficiency from three to four weeks earlier than otherwise.

Overlooking those first mistakes without getting excited is another good procedure on the part of the executive and the regular employees working with the new man. When he makes an error which would call for attention if committed by an experienced employee, it is a good time to stop and think before becoming angry. Correction is certainly in order but it should be given with utmost patience and more in the form of explanation than reprimand. He will seldom forget an experience of this nature and it can have a marked effect on his feelings toward his job in the future. Pats on the back always mean more during the first week on the job than at any other time. Many executives, who know the value of such a procedure, go out of their way to find an instance justifying such a compliment. A compliment from "the boss" for extra effort gives him assurances that he has the right idea. The lack of such a compliment may implant the thought that extra effort is not appreciated and there is little reason to do anything more than required to hold onto his job.

His opportunities for the future should be made clear during the employment interview and during his first days on the job. Assurances from his direct supervisor and from the people with whom he works that such opportunities actually exist add to his confidence in his choice as a good place at which to work.

The foregoing present a few of the many factors which can help to make the new employee a good employee by recognizing his existence during the first crucial week on the job. Taking appropriate steps to answer such questions for him assures obtaining maximum results from the new man much more quickly than where these matters are ignored.

Dodson's Digest



Ice control begins at home

Drove out to see Jim Phillips the other day, Jim is a county road commissioner, and I wanted to talk to him about Calcium Chloride. But I couldn't get his mind off the new car he had just bought. He insisted on taking me out for a ride, so I slid into the seat beside him, and we headed for the highway.

"Look how this car hugs the road," Jim said, as we took a sharp curve with no apparent effort.

We came to a clear stretch of highway, and Jim started to speed up. "Look at that speed, Dod!" he exclaimed. "And my foot is still two inches from the floor."

We turned around and headed back toward Jim's office. "I'm going to take good care of this car," Jim said. "In fact I just had it winterized—put in antifreeze, and . . ."

"Good idea," I agreed. "And speaking of winterizing, I hope you've got your road-maintenance operations winterized, too. Your stockpiles should be treated with Calcium Chloride to prevent them from freezing, and to keep your abrasives free-flowing and easy to handle."

"And if you want speed, nothing melts ice as fast as Calcium Chloride. What's more," I continued, "Calcium Chloride melts ice effectively at any temperature you'll encounter."

"And talk about hugging the road! Calcium Chloride anchors abrasives firmly to the road, so they won't be swept off by wind and traffic. You'll need less abrasives, and . . ."

"Thanks for reminding me," Jim broke in. "I'll have to get some Calcium Chloride this afternoon."

"That's a good idea, Jim," I said. "You haven't much time before the stockpiles start freezing."

"Who said anything about stockpiles?" Jim laughed. "I've already treated them. I just want to take a bag of Calcium Chloride home with me. I'm not going to drive my new car on a slippery driveway!"

L. D. DODSON

P.S.—Get valuable information on ice control in our leaflet, "How to Make Icy Surfaces Safe with Wyandotte Calcium Chloride." For your free copy, just drop me a line. Wyandotte Chemicals Corp., Wyandotte, Mich. Offices in principal cities.

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HEADQUARTERS FOR CALCIUM CHLORIDE



Values Obtained from a Street Inventory

An inventory of about 1,000 miles of streets has been initiated by the City of San Diego, Calif. The work will be done by two inspectors who will walk and drive over all streets and record by locations the cost account item and number of work units needed to eliminate the

defective and hazardous conditions that exist on and along the streets. The field data will be processed by tabulating machines to give printed itemized work lists for each type of maintenance that needs to be done in each district. Inspections will be made of all streets about every six months, but monthly inspections will be made on expressways and major thoroughfares.

Good Refuse Sanitation

(Continued from page 86)

tain amount, based on its population, for the use of the landfill. The cost to each village and township is approximately 50 cents per person per year.

A centrally located landfill has eliminated a dozen open dumps and considerable roadside dumping. The association contracts to have trenches dug and the refuse compacted and covered. A 40-acre tract of land belonging to the county is used. The village and township refuse collectors haul from 2 to 15 miles to the landfill. The site is kept clean and neat.

The local health department sanitarian, Robert Boyle, was the stimulating force behind this program in Putnam County. He contacted all village, township and county officials to get their ideas of what should be done to get rid of the open dumps and to eliminate roadside dumping. Several meetings were held to discuss the problem and a plan was worked out. Needless to say, it would be almost impossible for each of these small villages and townships to install satisfactory individual refusal disposal facilities.

Private Enterprise Helps

Stark County, Ohio, has large areas of built-up subdivisions outside of unincorporated cities or villages. Private haulers furnished collection service to these areas. The wastes which were collected were disposed of in 39 open dumps scattered over the county. The problem was such as to warrant setting up a public collection and disposal service by the county. But the county, having many problems of getting water and sewerage facilities to its residents, was preoccupied with getting this job done. Stanley Strine, Sanitary Engineer and Director of the Division of Sanitation of the Stark County Health Department, felt that the problem was one that could not wait until such time as public facilities could be provided. He undertook a program to improve

the services of the private collectors and to get rid of the open dumps.

The health department adopted regulations requiring that all private haulers obtain permits to engage in refuse collection services. The regulations also required that the health department approve all refuse disposal operations in its jurisdiction. Before issuance of a permit to a private collector he had to have reasonably satisfactory equipment to do the job.

Notices were sent to all operators of open dumps giving a reasonable time to convert to sanitary landfills or to cover the dumps and abandon them. Visits were made to each dump and the operator advised on how he could convert the site into a landfill, if it were suitable. There were several court cases but the health department received the help of the courts. Although some extensions were granted to dump operators, at the end of one year 28 dumps had been eliminated or converted into sanitary landfills. Several small dumps are still permitted to stay open but these are to be closed as soon as landfill disposal can be arranged for private collectors within a reasonable haul distance.

Regarding this program, Mr. Strine states, "We would rather have a public system of collection and disposal of garbage and refuse; however, as the county was not able to set one up at this time, we have done what we think is the next best thing. The private collectors are giving better service since bringing them under our supervision and we are rapidly getting rid of all open dumps in the county. If the collection and disposal service offered by the private operators continues to improve there may not be a need for the county to set up a public system."

This is a good example where, under the leadership of the health department's sanitary engineer, a satisfactory county refuse collection and disposal program is being worked out with the help of private enterprise. (Turn to page 150)

NEWS OF ENGINEERS

R. S. RANKIN, who has completed 27 years of service with Dorr-Oliver, Inc., retired as chief of the Sanitary Technical Division on Oct. 1, and was succeeded by Fred G. Nelson. Mr. Rankin will continue in a consulting capacity on sanitary engineering problems.

G. D. HOUTMAN & SON, civil engineers of Media, Pa., have purchased the engineering practice of Over & Tingley of Havertown, Pa., which firm has specialized in land developing and surveying and municipal engineering.

RONALD TATONE, formerly City Engineer of Grants Pass, Ore., and WALTER L. HUSS of Eugene, Ore., have joined the staff of Clark, Groff & Cave, Consulting Engineers of Salem, Oregon.

GEORGE W. REID, Associate Professor of Civil Engineering, has been designated Director of the Bureau of Water Resources Research, an agency recently established by the University of Oklahoma to coordinate all research dealing with water resources and usages.

EMIL C. JENSEN is the new President of the Federation of Sewage & Industrial Wastes Associations. KENNETH S. WATSON was elected Vice-President. Mr. Jensen is Chief of the Division of Engineering and Sanitation of the Washington State Department of Health. Mr. Watson is Consultant, Water Management and Waste Control, for the General Electric Co., Schenectady, N. Y.

FSIWA Member Association 1957 Meetings

Meetings of FSIWA member associations for 1957 have been announced as follows: New York: Jan. 17-18, Belmont Plaza, New York City; Arkansas: March 18-20, Marion Hotel, Little Rock; Arizona: April 4-6, Maricopa Hotel, Mesa; Kansas: April 10-12, Broadview Hotel, Wichita; California: April 24-27, San Diego; Maryland-Delaware: May 22-24, Commander Hotel, Ocean City, Md.; Ohio: June 19-21, Miami Hotel, Dayton; Central States: June 26-28, Sherman Hotel, Chicago; Kentucky-Tenn.: Sept. 23-25, Brown Hotel, Louisville.

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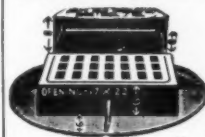
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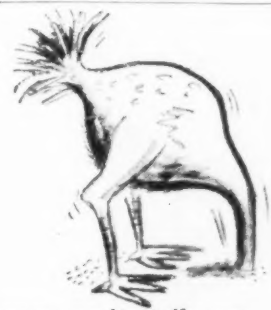
SEE PAGES 32 TO 48

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Meeting its needs *modernly*, the City Engineering Department has wisely equipped itself with a fleet of eight "Flexible Bucket Machines". The machine shown "on the job" is the first unit purchased in 1948—*still going strong*.



FLEXIBLE INC.

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(Distributors in Principal Cities)

In 1950, the Ohio legislature made it possible for the commissioners of a county to set up refuse collection and disposal districts. Franklin County was the first county in the state to avail itself of this legislation. Three other Ohio counties (Lucas, Montgomery, and Hamilton) have set up, or are in the process of establishing, county-operated refuse facilities.

County Refuse Sanitation

It is noteworthy that the law making it possible for counties to set up refuse collection and disposal facilities provides that the County Sanitary Engineer, working under the County Commissioners, shall plan and administer the program. This will insure that the garbage and refuse program will be given the same quality of attention that is given other sanitary services such as sewerage and water.

Many other examples of Ohio communities that have solved their refuse problems in the past several years could be given. Other places could be named that still have much to do. In any community where progress has been made it can be attributed to able leadership on the part of public officials and to a desire of the people they represent to

improve their community. As more communities demonstrate that sanitary refuse collection and disposal can be provided at reasonable cost, the public is going to insist that its community have these basic facilities. Too many communities in Ohio have installed complete refuse programs to uphold any argument that having one is an impossibility. It is up to the community leaders to provide such programs.

Special County Equipment

(Continued from page 92)

Bridge steel can be loaded in the yard—either onto another truck or on its own bed and it is good for placing steel beams on small bridges.

It is an excellent truck to haul the dragline or clamshell buckets for our half-yard machine. The truck can load the bucket with its crane wherever the bucket happens to be. It can unload the bucket or buckets at the site where they will be used by the larger machine.

Our crews have been educated to the use of machinery. Sometimes it is rather surprising to see what ways these crews figure out to use machinery instead of manual labor.

It is all good and makes for faster and cheaper work.

Every highway department must mechanize as far as possible if they are to accomplish much on their budgets today. I have tried to tell about one piece of equipment that we like. I think others will like it if they try it.

Trailer Equipment

We have two other pieces of equipment which are very handy and useful. These are two semi-trailer cargo vans converted into a combined traveling workshop, tool room, office and shelter. Our first semi-trailer was purchased in 1950 and the second one in 1951. The first unit, consisting of a tractor and semi-trailer, was purchased for \$700 and the second unit, just the semi-trailer, cost \$350.

Back in 1949 our then existing shanties which were used on bridge sites or larger work sites were deteriorating rapidly. They were not very satisfactory at best and were quite awkward and hard to handle. When it came time to move, it was necessary to remove all equipment and supplies from the shanty in order to lift it onto a low bed trailer. Then the equipment and supplies had to be handled separately for

transportation to the next site. All of this took extra time and was not very satisfactory any way. About this time, I started looking for a semi-trailer that I could convert into a traveling shanty. After a few months' search the first unit was located; it was in good shape. Everyone liked the trailer very much after the conversion was completed. The additional unit was purchased the following year.

The trailers are fitted with racks and boxes for tools, several drawers under a work bench; some bins for nails or spikes; a stove for cold weather; and a desk in the front end. A crew going out to work on a bridge or other work project has all their tools and some small supplies right with them all the time. As soon as they get to the project site they park the semi-trailer and tractor in a convenient location. They do not have to unload tools and supplies from other trucks and store them in the shanty; everything is already in place in the semi-trailer. When the project is finished and the last tool is loaded, the trailer is ready to move on to another job. There is no time taken up by having to load a shanty onto a trailer and then moving to another site.

A trailer makes a work crew more mobile. Ours have materially reduced the time that used to be required to move from one project to another. This makes for higher efficiency. Wages and materials are high today and a crew today must be as efficient as is possible if much work is to be accomplished on the highway budgets that we now have.

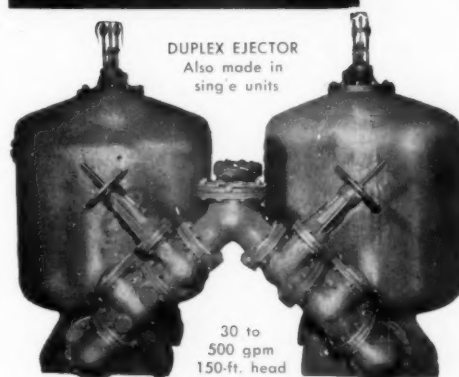
Trailers may be of any size desired. Our first trailer is 16 feet long and the second trailer is 22 feet long. These trailers have been satisfactory but a little more length would not hurt anything.

The Matter of Signs

Another piece of equipment that we like is just an adaptation of a standard truck chassis and a standard truck body. This is our sign truck. In the past we have used whatever truck was available for sign work—usually an older truck. This time we purchased what we think will make a good sign truck. All equipment and materials are inside and out of the weather. This truck is a forward control type Chevrolet chassis with dual rear tires and a 138-inch wheelbase with a capacity of about two tons. There are two front sliding type doors located near the driver, on either side of the truck. The body encloses the entire truck and forms one large

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compartment with rear doors that will open to the entire width of the body.

This truck is new and is not fully equipped at the present time. We expect to place flasher lights on the front and rear, near the top. The interior will have bins, racks, and a small work bench built in when completed. This will allow all equipment, materials, and signs to be carried inside in a neat and orderly arrangement. Everything will be protected from the weather.

The truck body has large side panels and a large area on the rear doors. We have tried to do some public relations work with the vehicle and on each we have placed three standard highway signs. In addition we have tried two slogans "Safety Is Our Business" and "Obey All Traffic Signs." On the rear we have "Traffic And Safety Dept." and a large "Slow" sign. The traffic signs and the letters in the slogans are reflectorized with Scotchlite.

Highway signs on the secondary road system are becoming more important each day. Travelers depend on signs to guide them and the speed of modern traffic makes signs necessary as a safety measure. Therefore, we decided to prepare for this type of work with what we thought was the proper type of equipment.

Special equipment does not necessarily mean something entirely new. Generally you can find some standard equipment and adapt it to your needs. It is much cheaper to do this than to design your own equipment. Some times we make minor modifications in our own shop but we always use standard equipment. If you will look around, you can almost always find some standard piece of equipment that will suit your needs. Don't be afraid to try something different than your usual equipment or your usual way of doing your work. Often you will discover an easier and better way.

Water Consumption Estimates

(Continued from page 77)

is possible to select one or more cities where conditions are somewhat similar to the one under consideration and to make such additional studies as are indicated.

Acknowledgements

The Editor thanks the following additional contributors of information used in the tables: Edward J. Clark, New York City; Bernard L. Werner, Baltimore; Peter C. Karalekas, Springfield, Massachusetts; W. M. Franklin, Charlotte, North

Carolina; Robert D. Wright, Lynchburg, Virginia; E. M. Johnson, Raleigh, North Carolina; Frank Szuniewicz, Jr., Buffalo, New York; George Van Dorp, Toledo, Ohio; Wendell R. La Due, Akron, Ohio; L. A. Smith, Madison, Wisconsin; Dale Moffitt, Des Moines, Iowa; John C. Detwiler, Omaha, Nebraska; Morrison B. Cunningham, Oklahoma City; Henry Graesser, Dallas, Texas; Albert R. Davis, Austin, Texas; C. M. Hoskinson, Sacramento, California; R. C. Kennedy, Oakland, California; Paul Beerman, San Diego, California; and John L. Geren, Salem, Oregon.

III—By State Sanitary Engineers

AS A PART of the program by Public Works Magazine to obtain the most reliable estimates of future water use, letters were sent to a number of State Sanitary Engineers. The purpose of getting these estimates was to provide as sound a basis of design as possible for engineers who are charged with planning water works for cities and residential areas. To provide a fairly broad basis, since water consumption is markedly affected by local climatic and other conditions, states in representative areas of the country were asked for data. Replies included the following:

Massachusetts — Information was received from Clarence I. Sterling, Jr., Director, Division of Sani-

tary Engineering, who summarized his estimate: "The rate of increase, in gallons per capita per day, annually for the next twenty years will be: in industrial communities 1.75 gpcd; and for residential communities 1.1 gpcd. The probable consumption in 1976 in industrial communities will be 193 gpcd and in residential communities 117 gpcd.

"You will note we have broken down the Massachusetts communities into industrial and residential, feeling that this shows a truer picture of conditions in this State.

"With regard to the maximum rates of use in the future, we hesitate to make any definite predictions of the percentage of the maximum daily or hourly consumption over

the average for the year. We believe there will be no essential change in the accepted percentage at the present time, namely 140 to 150 percent of the average daily consumption for the maximum day; and 250 percent of the average daily consumption for the maximum hour. We see no reason why these should vary in 1966 or 1976 from present day figures. Our estimates are based on a probable increase in population in this State to 6,000,000 by 2000.

"To summarize, we feel there will be a substantial increase in per capita water consumption in the next ten years in both industrial and residential communities. We feel, however, there will be a future tendency for the re-use of water which will result in the rate of increase becoming less rapid."

Indiana — B. A. Poole, Director, Bureau of Environmental Sanitation replied: "The 1955 Indiana Legislature enacted an 'Indiana Water Resources Law' and established a study committee to make a report on the water situation in this State. The sub-committee on water use has been making a study of available data on water consumption. The statewide per capita use of water in all public water supplies shows an average annual increase of 2.3 gpcd in the 1940-1954 period. In 1940, per capita consumption was 94 gals. per day; in 1954 it was 124 gals. Estimated per capita consumption per day for 1966 is 153 and for 1976 it is 177 gals.

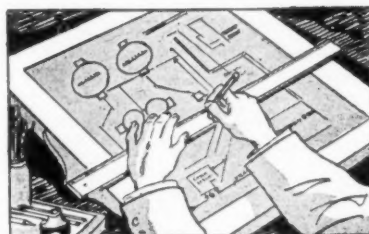
"There are some variations in respect to size. Municipalities with populations in excess of 100,000 show an average annual increase of 3.3 gpcd over the 1940-1954 period. With an average of 139 gpcd in 1954, it is expected that 1966 consumption will be 179 gpcd and 1976 consumption 212 gpcd. Cities in the 25,000-100,000 range show an annual increase of 2.3 gpcd and may be expected to reach 163 gpcd in 1966 and 186 gpcd in 1976. In the 2,500-25,000 population bracket, the average annual increase is 1.9 gpcd and the 1954 consumption 115 gpcd. Under 2,500, 1954 consumption was 62 gpcd and the annual increase was 0.43 gpcd.

"Maximum use data, based on the maximum day of use, shows an increase, based on all public water supplies in the state, from 163 gpcd in 1940 to 205 gpcd in 1954, an average annual increase of 3.0 gpcd. Forward projection of this rate indicates a maximum daily use of 271 gpcd in 1976. The cities over 100,000, however, show an average annual increase of 5.0 gpcd, resulting

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in an estimated maximum daily use of 340 gpd in 1976. For the 25,000—100,000 range, the annual increase in the 1940-1954 period was 2.3 gpd, giving an estimated maximum daily use of 259 gpd in 1976. For the 2,500—25,000 group, corresponding figures are 1.9 and 225 gpd; and for the under 2,500 group 0.85 and 145 gpd."

Maximum hourly use was not reported.

Illinois—Information was received from C. W. Klassen, Chief Sanitary Engineer. Reference is made to a very detailed report by Alvord, Burdick & Howson for the City of Chicago, covering both Chicago and the adjacent suburban areas. "The figures on water consumption in the City of Chicago show a 1950 use of 243 gpd and estimated future use of 252 gpd in 1960, 257 in 1970 and 262 in 1980. In the 51 suburban areas served presently by Chicago, 1950 consumption averaged 140 gpd; and estimates for the future are 158 gpd for 1960, 165 in 1970 and 173 in 1980.

"In the communities in this area not presently served by Chicago water, 1950 water consumption was 90 gpd and estimates for the future are 100 gpd in 1960, 106 in 1970 and 113 in 1980.

"Information on water consumption over the entire state, exclusive of Chicago is estimated as follows: 1955, 120 gpd; 1960, 140 gpd; 1970, 160 gpd; and 1980, 180 gpd. There has been a large trend toward industrialization as well as many housing developments and an increase in water consumption due to greater employment of home water-using facilities.

"We feel the maximum daily per capita use will be about 150 percent of the average day, while the maximum hourly use will be about 200 percent of the average day. We do not see where these figures will change materially in the next ten years."

Kansas—Russell L. Culp, Kansas State Board of Health, forwarded a copy of an excellent paper on "Municipal and Industrial Water Supplies as Related to the Water Resources of Kansas." This included considerable analytical data on present and probable future water uses. He also stated that the average water consumption in the cities of Kansas, according to a 1954 survey, was 155 gpd. The rate of annual increase in use is estimated at 1.5 gpd, with a resulting average consumption of 170 gpd in 1966 and 185 gpd in 1976. He estimates the maximum day in 1966 at 300 gpc

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and in 1976 at 325 gpc. No estimate of maximum hourly use was made.

Oregon — Curtis M. Everts, Jr., Chief Sanitary Engineer says: "We have data indicating that the use of water from public systems in Oregon during the fiscal year 1951-1952 was 210 gpcd, based on 1950 population figures. The ratio of water consumed in the maximum month to that used in the average month was 1.5."

Texas — Henry L. Dabney, Chief, Water Supply Section, Division of Sanitary Engineering, sent reproductions of data from water supply studies and reports by the Department of the Interior, Bureau of Reclamation, area and Regional Planning Offices, using water supply requirement data accumulated by the Bureau of Business Research, University of Texas. These studies included areas of the Texas Panhandle and also along the Gulf Coast.

"While we have been unable to conduct comprehensive reviews of water usage, we feel the probable rate of increase in gallons per capita per day will be 1.5 to 2.0 percent per year in the arid regions and from less than 1.0 percent to approximately 2 percent along the Gulf Coast, depending on the rainfall and evaporation rates during the next 20 years. It is also our belief that the maximum day of water consumption will remain fairly constant with present-day figures of 150 to 200 percent of the average; also that the maximum hourly rate will approximate 300 percent of the average rate."

Attached to the letter was a table showing for 51 communities the population served, the rainfall, and the minimum, average and maximum per capita use in 1954. Other tabular data showed actual use of water in 1950 and estimated per capita use for 1960, 1970, 1980, 1990, 2000 and 2010 for 11 cities in the High Plains area. A chart illustrates the total potential water requirements for the Gulf Coast area. Municipal and industrial uses are expected to total 890,000 acre-feet in 1960, 1,300,000 acre-feet in 1970 and 2,400,000 acre-feet in 2000. Irrigation requirements at present amount to 3,300,000 acre-feet, while potential requirements are estimated at 10-, 500,000 acre-feet annually.

A study of 39 small to medium cities, made in 1950 indicated an average of 3.7 persons per water connection. The smallest number reported was 2.9 and the largest 4.7. Of the 39 cities, 20 were within 10 percent, plus or minus, of the average.

PUBLIC WORKS EQUIPMENT NEWS

Published Monthly

December, 1956



Vibro-Joint Cutter For Concrete

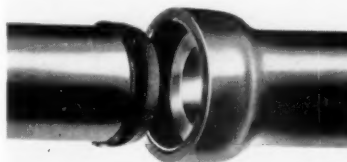
Vibro-Joint cutter for concrete road construction is announced by Seaman-Andwall. The new Vibro-Joint cutter uses a new principle of procedure which makes possible sawed joints with all their advantages in smoother riding surfaces, greater strength and better wear, at a cost lower than the conventional hand-formed joints. It is a completely self-contained unit. Following the longitudinal finishing machine, it rides either the forms or adjacent slabs. Braked into position where the joint is to be made, the long cutter bar is lowered, hydraulically into the concrete, and

vibrated until it reaches the desired depth. This creates a weakened plane at the future joint location by displacing the aggregate, leaving only sand and cement in the joint area, easily adapted to joint sawing with fibre abrasive blade. The saw cut can be reduced to one inch, which also means a reduction in the filler used. It is available in two sizes—for 18-ft. to 25-ft. paving lane widths, and for 10-ft. to 13-ft. lane widths. For full information write Seaman-Andwall Corp., Dept. R-227, Milwaukee 1, Wisconsin, or circle No. 12-1 on the reply card today.

PVC Coupling For Sewer Pipe

An entirely different method of permanently jointing clay sewer pipe to insure a watertight, root-resistant, and flexible union, has been announced by W. S. Dickey. Called the Dickey PVC (polyvinyl chloride) coupling, it is resistant to the acids, bases, solvents, gases, and greases normally found in domestic or industrial sewage. The coupling consists of rings, precision molded and fused on the spigot and in the bell of the pipe. A joint is made by applying Dickey lubricant sealer to the mating surfaces of the coupling and pushing the spigot firmly into the bell socket. It is a compression-type joint and the mating surfaces in tight contact with each other, ex-

ert a pressure on the inside of the bell and the outside of the spigot, thereby increasing the bond of the coupling with the pipe. For complete information write W. S. Dickey Clay Mfg. Co., P. O. Box 228, Kansas City 42, Mo., or circle No. 12-2.



Two lengths of clay sewer pipe about to be joined with a Dickey PVC coupling. Notice the taper of spigot end

Low Cost, Efficient Diesel Air Compressor Now Available

The JW-78 diesel driven air compressor has been introduced by Cerlist Diesel. The unit is rated at 78 cfm, 100 psig, and is available as a portable model with two rubber-tired wheels and drawbar, or as a stationary model for mounting on a truck bed or other foundation. The horizontal, single cylinder diesel engine, built at a right angle to the single compressor cylinder in a common crankcase and with a single, forged steel crankshaft, is a unique design characteristic. The engine

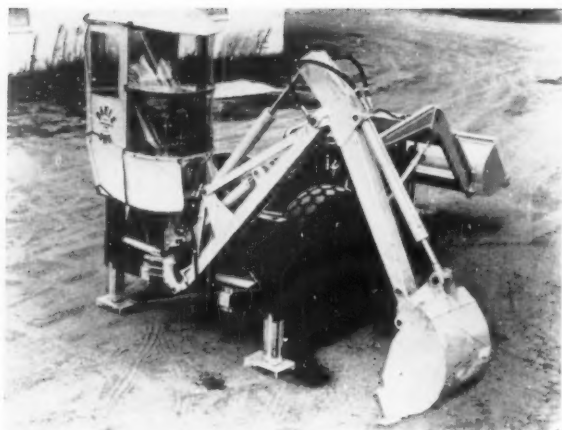


Diesel driven air compressor, 78 cfm, will operate in all types of weather

consumes approximately 4 cents of fuel per 1000 cu. ft. of compressed air delivered. For complete information write JW Division, Cerlist Diesel, Inc., Burlington, N. C., or circle No. 12-3 on the reply card.

Spiral Nails As Wood Fasteners

The spiral nail, an advance in common wood fasteners, is announced by Jones & Laughlin Steel. Advantages of the spiral nail over the common nail include: Increases holding power; drives easier; reduces wood splitting; and costs less per nail. There are 38 percent more spiral nails per pound than of common nails. The spiral nail tends to push aside the wood fibers when being driven rather than cutting them. Write Jones & Laughlin Steel Corp., 3 Gateway Center, Pittsburgh 30, Pa., or circle No. 12-4.



Keep cold weather out with this cab for the Davis backhoe



Center mount rotary mower for grass and weed maintenance

Cab Protection On The Davis Backhoe

Cab protection for the operator of the Davis Model 185 Backhoe is now available from Mid-Western Industries. The cab-mounted backhoe has been described as an "all-weather go-getter." The lighthouse-type window, made of non-breakable and shatterproof clear plastic, gives the operator full vision at all angles of operation. Side curtains and doors are easily removed for warm weather use. The cab fits on the seat and footrest assembly so that it revolves with the boom. It is formed of flat steel and is covered with heavy duck. The backhoe operates to either side or to the rear of the tractor. For more information write Mid-Western Industries, Inc., Wichita, Kans., or circle No. 12-5 on the reply card.

New Traffic Control Color Paint is Pink

The latest and entirely new use of traffic paint color that is designed for a very specific purpose is announced by John W. Masury & Son. It is designed specifically for school zones, and is named the "School Zone Warning Pure Pink." It is a reddish pink of brilliant intensity; visibility is about the same as traffic white or yellow. In practical use, when a car approaches a school zone, the driver is immediately made conscious of that fact by noticing a change in the color of the road markings; this will almost immediately prompt him to slow down. For full information write John W. Masury & Son, Inc., 1700 Bayard St., Baltimore 30, Md. or circle No. 12-6 on the reply card.

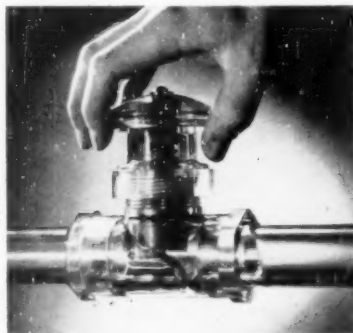
Rotary Mowers For Case Tractors

The Danco rotary mower is now available for Case industrial tractors. Models come in width of cuts of 94 and 96 inches. The cutting height can be adjusted from 2 to 12 inches. The mower is easily and quickly attached and is center mounted on the tractor for stability

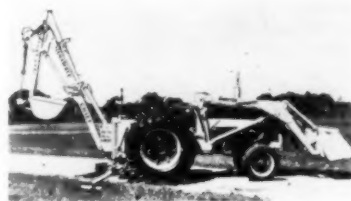
on slopes, greater maneuverability and ease of operation. Safety chain guard and bumper are optional equipment. For prices and full details write Danuser Machine Works, Inc., Box 5095, 2525 South Sheridan Road, Tulsa, Okla., or circle No. 12-8 on the reply card.

Globe-Type Plastic Valve

A new globe-type valve has been introduced by Sloane Mfg. which will not rust and resists corrosive action. Made of Tenite butyrate plastic, the valve's interior surfaces are extremely smooth, permitting an unimpeded flow through the unit. When it is closed, a positive plastic-to-plastic seal is formed. There are no washers to deteriorate; and since the valve is transparent, flow can be observed readily. The new valve is available with either plain ends for "solvent-welding" to butyrate pipe, or with threaded ends, for connecting to threaded metal and plastic pipe. For full data write Sloane Mfg. Co., 12270 Montague St., Pacoima, Calif., or circle No. 12-7 on the reply card.



Globe valve allows visual inspection



Shawnee Backhoe-Loader For IHC 400 Tractor

The Shawnee Loadmaster loader Model LM-3A and the Model D-90 "Chief" backhoe have been approved for mounting on the IHC W-400 industrial tractor. The Loadmaster lifts 3500 lbs. and to a 9-ft. dumping height. The unit installs or removes in 20 minutes' time. Attachments available to replace the bucket are: bulldozer back fill blade, 76-in. utility bucket, 66-in. material bucket and a weight box. The "Chief" Backhoe digs efficiently to 14 ft. deep with an actual reach below surface of 15 ft. It reaches horizontally 20 ft. and has exclusive "push-pull" design. It operates in three 120° quadrants which may be changed by the operator without moving from his seat. Additional information may be had from Shawnee Manufacturing Co., Inc., 1947 N. Topeka Avenue, Topeka, Kans., or circle No. 12-9 on the reply card.

Hubodometers For Grease Cap and Oil Seal Use

New vented hubodometers which can be attached to trailer hub caps using oil seal or grease packing have been introduced by Engler Instrument. The Engler vented hubodometer is adaptable without any further alteration or cost. It is easy to read and the figures remain upright regardless of wheel position. Instrument is enclosed within a triple-sealed, self-contained case, without any outside drive shaft. For prices and full details write Engler Instrument Co., 250 Culver Ave., Jersey City, N. J. or circle No. 12-10 on the reply card.

Highway Material Spreader

A new highway material spreader offering advanced features permitting highest-efficiency, year-around service has been announced by Shunk. The machine, called the Shunk front end reversible hopper-type spreader, permits sanding, cinder or salting in front of all four wheels, providing full traction for winter ice control work on streets, highways and hills. It can also spread behind the rear wheels for sanding asphalt roads or spreading stone, chips, calcium chloride and other materials. This unusual feature is accomplished through unit-design construction whereby the hopper, conveyor and spinners can be reversed as a single unit on the truck chassis. Reversing the machine can be accomplished quickly and easily by two men using jacks or a block-and-tackle. The in-front-of-the-wheels spreading feature also permits safe, highspeed operation up to 25-30 mph under icy conditions. It is available with hopper capacities from 5 to 12 cubic yards. Complete details from Shunk Mfg. Co., Bucyrus, Ohio, or circle No. 12-11 on the reply card.



Provide effective traffic control by using three horizontal red "T" signals

Three-Horizontal Red Traffic-Signal

The Autoflow "T" signal with its three horizontal reds has been introduced by Southern Signals. Contrary to the 12-in. red and to the double red application, the three reds of the "T" signal provide for adjustments of the red indication resulting in: Maximum controlled intensity without sacrificing normal distribution; greater range of readability on curving approaches, maintaining uniform intensity and distribution at all ranges; and maximum coverage without sacrificing intensity. For complete information write Southern Signals, Inc., 222 Beach St., Shreveport, Louisiana, or circle No. 12-12 on the reply card.

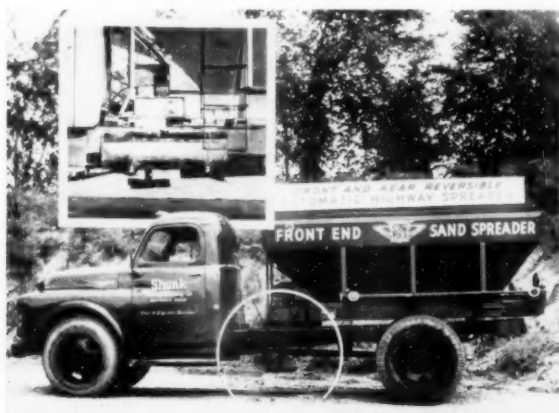
Torque Converter Model "660" Grader

A new addition to their Adams line, a torque converter model of the big "660" motor grader, has been announced by LeTourneau-Westinghouse. Designated as the Adams Power-Flow 660, the unit has basically the same design features as the standard model "660" with the

additional operational advantages of a torque converter drive train plus a 27 percent increase in engine power. It has a 190-hp diesel power plant with a single-stage torque converter. An exclusive feature is a mechanism which allows the operator to make changes in travel from forward to reverse, and vice versa, without hand shifting. Another item of importance is a tail shaft governor which automatically adjusts engine speed. Features such as power steering, rubber engine mounting, final drive, foot accelerator, moldboard and accessory options are identical with those of the "660" standard transmission machine. For further information on the Power-Flow 660 or any of the other models in the Adams line of 60 to 150 hp. motor graders write LeTourneau-Westinghouse Company, Peoria, Ill., or circle No. 12-13 on the reply card.

Ottawa Backhoe for Michigan Tractor Shovel

The Ottawa backhoe, with ground clearance for easy operation and maneuverability over rough terrain, is now available for the Michigan 75-A tractor shovel. Both the Model DX-75A backhoe, which digs to a depth of 11 feet, and the Model EX-75A with an 8½-ft. digging depth, can be equipped with buckets 12 to 36 ins. in width. The bucket positively ejects wet or sticky materials without loss of cycle time. Another feature is the Ottawa One-Trol which assures fast, smooth operation by the use of only two levers to control all actions which normally require the use of multiple levers. Power is obtained from the Michigan hydraulic system. More information from Ottawa Steel Division of L. A. Young Spring & Wire Corporation, Ottawa, Kansas, or circle No. 12-14 on the reply card.



Side view of the Shunk front and rear reversible spreader



Ottawa backhoe is very easy to operate over rough terrain



Automatic Curb and Gutter Builder

A new automatic curb and gutter builder capable of forming monolithic or integral roll-type curbs on paving jobs at the same time that the main slab is poured is announced by General Road Machines. In operation, a hydraulically-driven curb forming roll, spinning at 300 rpm, profiles the gutter line and forms the curb as the machine travels along the forms behind the main paving equipment. Concrete for the curb is left along the high curb side of the slab by an acces-

sory offset screed attachment on the finisher operating ahead of the curb builder. The machine comes in widths of 10 to 15, 12 to 18½, 20 to 25 and 18 to 25 ft. Other widths are available on special order. Powered by a 12-hp, 2-cyl. air-cooled engine, the unit is hydraulically driven. Travel speeds are infinitely variable from 0 to 40 feet per minute, both forward and reverse. For further information write General Road Machines, Inc., Niles, Ohio, or circle No. 12-15 on the reply card.

Wain-Roy Backhoe For "Payloador" Tractor Shovels

A backhoe designed for use with the Models HH and HU, 4-wheel drive "Payloador" tractor-shovels has been announced by Wain-Roy. The ¼-yard capacity backhoe is a completely independent unit and replaces the bucket quickly and easily by attaching it to the boom arm by only two pins and the hydraulic hose connections. It digs and dumps at a radius of 190 degrees, enabling it to work in congested areas. It has a digging reach of 12 ft. 4 ins. and will reach to a depth of

over 13 feet and load to a height of better than 9 ft. The bucket comes in standard widths of 14, 18 and 24 inches and bellhole widths in 14, 18, 24, 30 and 36 inches. For additional information write Wain-Roy Corp., Hubbardston, Mass., or circle No. 12-16 on the reply card.

Rotary Paint Mixer

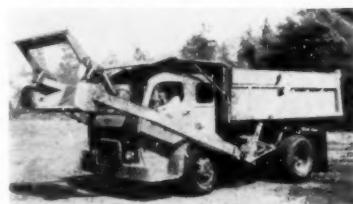
A new rotary paint mixer that needs no clamping to the paint container is readily powered by any portable power tool having a half-inch or larger chuck. Due to near perfect hydraulic balance and exclusive mechanical features it can be moved around freely by hand and is guaranteed not to splash, run wild, or cut into the container. The speed and thoroughness of the new in-surg-ing principle is time saving on practically every mixing or blending operation. Straining becomes unnecessary as the mix is creamy and speedily brushable. Blending from white to color takes but thirty seconds. For further information write Jiffy Mixer Co., 515 Market St., San Francisco, Calif. or circle No. 12-17 on the reply card.



Backhoe works well in congested areas

M-B Truck Loader Has Self-Loading Bucket

A new truck loader, featuring an unusual self-loading bucket, is announced by M-B Corp. This new unit has a hydraulically operated jaw that swings down to ground level about 13 ins. forward of the bucket lip. This jaw completes its closing cycle by pulling in and holding the full load in the bucket; and it eliminates the need for ramming the truck into the pile to get a full bucket, as the jaw insures this. Also, when picking up small piles, the bucket is filled completely without "chasing" the material or using men to sweep or shovel into it. This loader will fit onto most all types of trucks—4-wheel drive, COE, tilt cabs and conventional units—without violating overall truck width restrictions. Bucket capacity is half-yard, but larger buckets can be fur-



nished. This unit can speed up and lower costs on such work as sweeper pile pickup, sand and gravel operations, spoil removal, leaf pickup, snow handling and street and highway maintenance. It is fine for picking up and handling trash; or for any job where loading, leveling and grading can be done by a single unit. Complete data from M-B Corp., New Holstein, Wisc., or circle No. 12-18 on the reply card.

Truck-Mounted Crane

A new model crane, the S-1510, has been announced by Coles Cranes. It is designed to lift 15 tons at a 10-ft. radius with a 30-ft. boom. Basic design incorporates outstanding features of safety, flexibility, maneuverability and economy. It is available in gasoline or diesel-electric power. For full details write Coles Cranes, Inc., Joliet, Ill., or circle No. 12-19 on the reply card.

Power Roller Using Vibration

A new power roller using vibration instead of static weight has recently been introduced by Rolcor Industries. Weighing 1½ tons, it will produce the same compaction



Fills and hot mix asphalt can be rolled with power roller using vibration

density as deadweight rollers weighing 8-10 tons. The vibrating mechanism, consisting of weighted parallel shafts 36 inches long mounted on self-aligning bearings, produces a dynamic vertical thrust of 2936 pounds 2400 times per minute. Ground vibrations are controlled in any direction and can be felt within a variable radius of 24 feet. Chassis vibration has been 98 percent eliminated by rubber and spring mountings. Named the Vibrapac, it has been found that densities of 105 on sand fills and 136.8 on high-type hot mix asphalt are easily accomplished. For more information write Rolcor Industries, Minneapolis 3, Minn., or check No. 12-20 on the reply card.

"Versapox" New Protective Paint Covering

"Versapox" is used in tanks, piping, sewage ejectors, underground pumping stations, settling basins and any place that requires protection from water, sewage, fumes, fungus, acids, sand, grit, rocks, and other foreign matter. It will adhere to most non-waxy surfaces and is an excellent sealant for application to concrete, glass, wood, steel, plastic, and ceramics. It is not affected by temperatures ranging from sub-zero to well above 600 degrees F. "Versapox" is not a paint which requires evaporative type solvents, but a thermosetting type of material, requiring a chemical reaction of the ingredients for curing. Write Smith & Loveless, Inc., Merriam, Kansas for full information, or circle No. 12-21 on the reply card.



BOOKS IN BRIEF

SOIL INFORMATION BY ELECTRICAL RESISTIVITY

It is sometimes important to determine the geologic structure of the earth to considerable depths in order to know the location of bedrock and of sand, gravel or clay layers. The electrical resistivity method is one of the two geophysical techniques that can provide this information without drilling; and even if drilling is necessary, the amount required can be greatly reduced. This text is entitled "The Potentials about a Point Electrode and Apparent Resistivity Curves for a Two, Three and Four-Layered Earth." Authors are Harold M. Mooney of the University of Minnesota and W. W. Wetzel of Minnesota Mining & Mfg. Co. The text has 145 pages and sells for \$4.50. The accompanying curves sell for \$15. Together the price is \$18. Publisher is the University of Minnesota Press, Minneapolis 14, Minn.

URBANIZATION—DALLAS METROPOLITAN AREA

This second master plan report of the Dallas, Texas, Department of City Planning provides a detailed analysis of population, its distributions and growth characteristics. The report is ably illustrated with graphic presentation of statistics; among the more interesting of these consists of a number of bar graphs superimposed on a map of the area to illustrate growth of the various communities. It is indicated that the Dallas growth rate is 3 times that of the United States, and that the population of the metropolitan area is expected to exceed 1.5 million by 1980. The report was prepared by the Dallas Department of City Planning, Marvin R. Springer, Director.

AMERICAN CONCRETE INSTITUTE 5-YEAR INDEX

The American Concrete Institute, 18263 W. McNichols Rd., Detroit 19, Michigan, has published an index to the Journal of the American Concrete Institute, covering September, 1949, through June, 1954—ACI Proceedings Vol. 46 to 50 (Journal Vol. 21 to 25). The Supplemental 5-Year

Index indexes Journal contributions—papers, reports, and discussions—in three categories: title, author, and subject. A brief synopsis is given for each paper. The index supplements the ACI 20-Year Index, published in 1950, which covered Journal issues November, 1929, through June, 1949, (ACI Proceedings Vol. 26 to 45). The book has 72 pages—the first half devoted to the index, the second to synopses—6 x 9 in. format. Price is 35 cents per copy.

NIGHT VISIBILITY

Highway Research Board Bulletin 127 contains the following seven articles: Sign Brightness and Legibility; Candle Power of Rear Lights on Trucks; Specifications and Performance of New Sealed-Beam Headlamps; Cooperative Road Tests of Night Visibility Through Heat-Absorbing Glass; Safety Hazard of Tinted Automobile Windshields At Night; Visual Efficiency in Monocular Driving; and Stray Light in the Eye. Copies of this bulletin are available from the Highway Research Board, 2101 Constitution Ave., Washington 25, D. C. and are \$1.20 each.

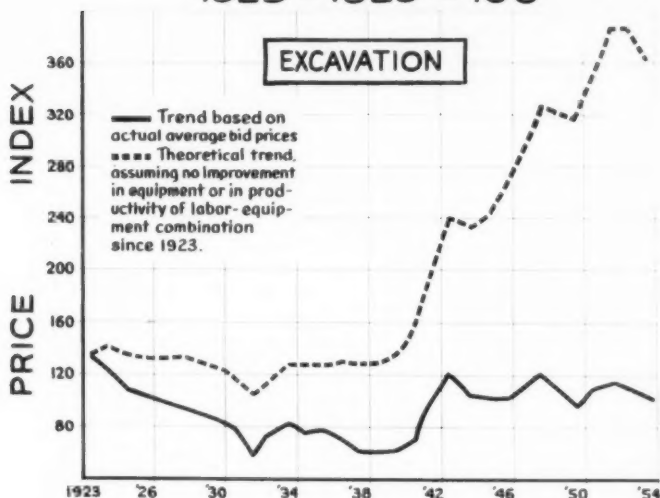
FLEXIBLE CULVERTS UNDER HIGH FILLS

This bulletin contains 4 papers relative to the subject as follows: 1) "Load Study of Flexible Pipes Under High Fills", by John H. Timmers, covers tests conducted on three 7-ft. diameter corrugated metal culvert pipes under 137 ft. of fill, each 512 ft. in length. 2) "Factors Affecting Vertical Loads on Underground Ducts Due to Arching," by Nicholas C. Costes and Charles E. Proudley, pressure theories on low or medium height embankments to unusually high embankments over flexible-type culverts. 3) "Performance Study of Multi Plate Corrugated Metal Pipe Culvert Under Embankment—North Carolina," by Nicholas C. Costes and Charles E. Proudley, describes the installation and performance of a 66-in. diameter culvert under approximately 170 ft. of earth fill. 4) "Influence of Compression and Clearing Strains in Soil Foundations on Structures Under Earth Embankments," by M. G. Spangler, discusses both the design of embankments and culverts and includes the amount of settlement and lengthening of 46 culverts and sluiceways. Copies are available from the Highway Research Board, National Research Council, 2101 Constitution, Washington, D.C., and are \$3.30 per copy.

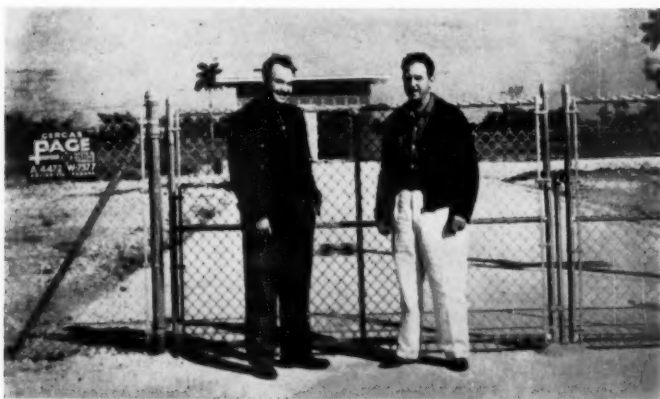
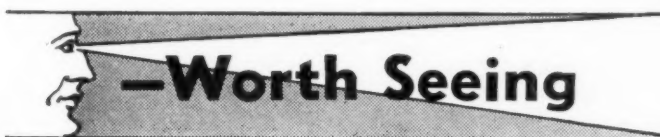
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Climax Engine & Pump Mfg. Co.	45	Mail Tool Company	66	Worthington Corporation	30
Clow & Sons, James B.	15	M & H Valve & Fittings Co.	118	Wright Engineers	156
Cole & Sons, Chas. W.	154	McWane Cast Iron Pipe Co.	126	Wyandotte Chemicals Corp.	148
Cole Mfg. Co., R. D.	40				
Columbia-Southern Chemical Corp.	112			Zimmer & Francescon	122
Consoer, Townsend & Assoc.	154				
Cotton, Pierce, Streander, Inc.	154				
D'Amato & Assoc., C. J.	154				
Darby Corp.	114				
Darling Valve & Mfg. Co.	31				
DeLeuw, Carther & Co.	154				

EFFECT OF IMPROVED EQUIPMENT ON HIGHWAY CONSTRUCTION PRICES 1925 - 1929 = 100



We preach it and the chart proves it—that improved equipment on highway and other public works projects pays off in construction prices. This chart, a feature of the "Productivity on Parade" theme of the 1957 ARBA Road Show to be held in Chicago next month, shows what excavation work would cost if the tools of 25 years ago were still in use today.



It takes a lot of fence to protect the water supply facilities of the City of Havana, Cuba. Here is one of the installations, with Engineer Ezequiel Calero, right, and Rafael Batista, Page fence distributor. Photo from American Chain & Cable Co., Inc., Bridgeport, Conn.

Deep under in the Holland Tunnel, which links New York and New Jersey, this crew placed 34,000 feet of new traffic line compound in four nights. Dwight T. Myers, formerly deputy commissioner and chief engineer of the New York City traffic department, now president of the Veon Chemical Corporation, is shown supervising the job. The new line is expected to last 4 to 6 times as long as previously used types.



Unloading salt for use on Chicago streets this winter. Three boat loads of Morton salt, total 20,100 tons, will be stockpiled by the city.

A Capitol improvement—one of 300 lighting standards made by Hubbard Aluminum Products Co. being placed in Olympia, Washington, on a highway bordering the state capitol grounds.





TYPE A ROTO-TROL

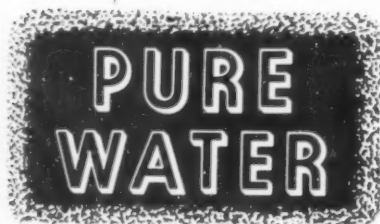
A pressure operated device for controlling, within small and exact limits, the high and low elevation of a water line in an elevated tank, standpipe, or reservoir. Usually located in pump house. Takes pressure connection from pump discharge line. Has built-in electric time delay device that prevents starting and stopping surges from cutting the pump in and out at each pumping cycle.

WATER LEVEL CONTROLS
DIVISION

HEALY-RUFF COMPANY
791 Hampden Ave., St. Paul 4, Minn.



**Synonym
for...**



**ROBERTS FILTER
MANUFACTURING CO.**
640 COLUMBIA AVE.
DARBY, PA.



WORTH TELLING

by Arthur K. Akers

★ **LET US** be the first this Season to extend to you best wishes for a very Merry and Happy Christmas. Your New Year's we will take up as a separate matter in our January issue!

★ **BADGER METER MFG. CO.** opens a new Southwest area branch, complete with all service facilities, in the Brook Hollow industrial district of Dallas.



Mr. Auckland

★ **KERRIGAN IRON WORKS**, of Nashville, New York and Chicago, appoints J. D. Auckland assistant manager, Lighting and Standard Division. Kerrigan is keeping step with the vast new road building program, including a contract for the new Kansas City Thruway.

★ **MORRISON STEEL PRODUCTS Inc.** announces appointment of George B. Earl as sales manager, Service and Body Division, Buffalo, N. Y. For the past eleven years he has been a department manager, Ford Division, of the Ford Motor Company.

★ **BENNETT MFG. CO.**, Alden, N. Y., leaders in creating a litter-free America, name Henry Schwartz, Box 12, Little Neck, N. Y. as metropolitan New York representative.

★ **JOE R. THOMAS**, formerly with Process Engineers' Pittsburgh office joins McGivern & Associates, manufacturers representatives, of Columbus, in their new Cleveland office.

★ **WHILE** we cannot understand the front cover we admire the content and format of *Cast Iron Pipe News*' September-October issue with its salute to the S.W.W.W.A.

★ **CHAIN BELT CO.**, Milwaukee, announces acquisition of General Road Machines, Inc., Niles, Ohio, makers of steel forms for concrete work and other highway building equipment. Donald T. Heltzel continues as general manager, J. J. Marcello, sales manager for General Road.

★ **JAMES B. CLOW & SONS, Inc.**, Chicago cast iron pipe makers, are sponsoring three Clow Graduate Fellowships in Sanitary Engineering at Ohio State and Purdue Universities, and Alabama Polytechnic Institute.



Mr. Kominck



Mr. Kalinske



Mr. Frick

★ **INFILCO Inc.**, elects A. A. Kalinske and E. G. Kominck vice presidents; appoints A. L. Frick, formerly with Wallace & Tiernan in southern California, manager of Infilco's Municipal Water Division.

★ **ROCKWELL MFG. CO.**, Pittsburgh, again branches out with the purchase of Dual Parking Meter Co., a former subsidiary of Union Metal Mfg. Co., Canton, O.

★ **A LITTLE** old Quaker lady had her car wrecked by a truck. Quaker to the last exasperation point, she walked over to the hulking truck driver and said, "When thee gets home to thy kennel tonight I hope thy mother bites thee."

MEMO Tues. P.M.

Joe -
got a Rush Job -
order me full set of
those little Ridgid
drop-head dies I like -
Hank



RIDGID

1/8" to 2" Drop-Head Threaders

Handiest darned ratchet threaders you ever used!

Really handy, time savers, easy to use. Pick up the size head you need, snap it into the ratchet ring . . . and start threading! Heads can't fall out. Dies reverse easily for close-to-wall threading. Conduit and special dies available.

Free carrier with sets. For perfect threads easily and long service, buy 'em at your Supply House.



Carrier Free with Sets

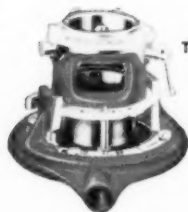
Bolt Threaders, too —

ask for **RIDGID OOR-B**,

same easy-work advantages as drop-head pipe dies.



Whole Line of **RIDGID** Pipe Threaders Offers You Extra-Easy Threading



RIDGID
Jam-proof 65R
Threads 1" to 2" pipe
with 1 set of dies.



RIDGID
504 Threader
for power drive use—
threads 1" to 2" with
1 set of dies.



RIDGID
4P Geared Threader
2 1/2" to 4" pipe—
extra-easy handling,
no upkeep.

RIDGID
Top Quality Sulphur-Lard
Thread-Cutting Oil



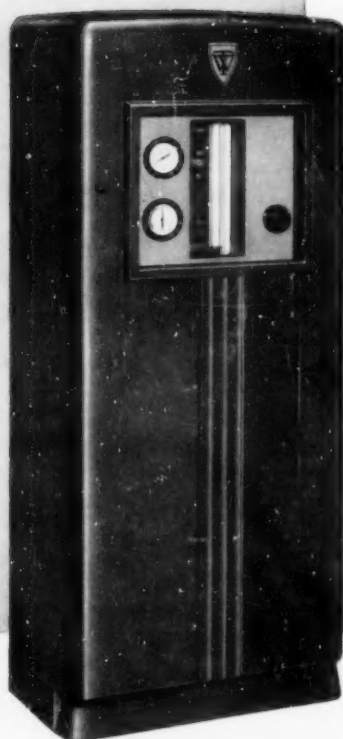
The Ridge Tool Company • Elyria, Ohio, U. S. A.

WALLACE & TIERNAN

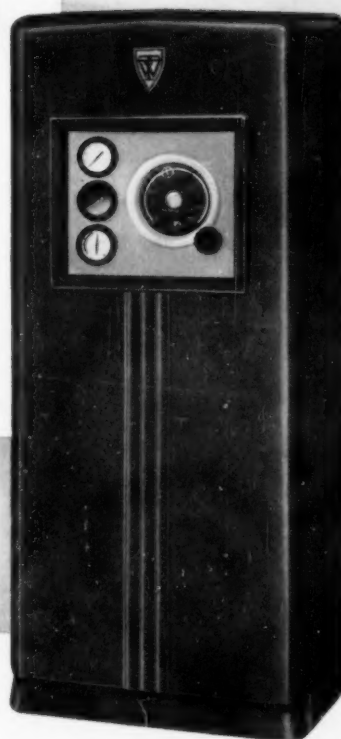
V-NOTCH

variable-orifice

CHLORINATORS



A-711 V-notch Chlorinator has rotameter indicator with 10 to 1 feed range



A-712 V-notch Chlorinator has dial indicator with 20 to 1 feed range

NEW

V-notch Chlorinators **SIMPLIFY** *Chlorination*

With the new Wallace & Tiernan V-notch Variable-Orifice Chlorinators:

OPERATION IS SIMPLIFIED as one injector control starts or stops the unit. Chlorine gas is turned on or off automatically.

SETTING FEED RATE IS SIMPLIFIED as one control sets feed rate precisely at both high or low feeds.

INSTALLATION IS SIMPLIFIED as units are

shipped ready for operation. No water supply is needed at the chlorinator. A remote injector uses only standard water supply fittings.

MAINTENANCE IS SIMPLIFIED and virtually eliminated. All parts are corrosion resistant, mounted in an attractive modern cabinet.

For full details on manual or automatic proportional V-notch Chlorinators, contact your W&T representative, or write to the address below.

*A New Development from
Wallace & Tiernan Research*



WALLACE & TIERNAN INCORPORATED

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